

THE NATIONAL MUSEUM

at Manila, Philippines



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THE NATIONAL MUSEUM

at Manila, Philippines

by Serafin G. Aquino, Jr.

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Submitted in partial fulfillment of the requirements for  
the degree of

Master in Architecture

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/

The Graduate House  
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Mr. Pietro Belluschi, Dean  
School of Architecture and Planning  
Massachusetts Institute of Technology  
Cambridge, Massachusetts

Dear Dean Belluschi:

I hereby respectfully submit this thesis entitled "The National  
Museum at Manila, Philippines" in partial fulfillment of the require-  
ments for the degree of Master in Architecture at the Massachusetts  
Institute of Technology.

Yours very truly,

Serafin G. Aquino, Jr.

Lawrence Bernhart Anderson  
Head, Dept. of Architecture



..... to an unfaltering faith.

".....show to the open-minded that the new museums are to be museums properly so-called, - homes and work-shops of the Muses. They are not to be storage warehouses, or community attics, or temples of dead gods, or copies of palaces of an extinct nobility, or costly reproductions of ancient temples, or grand and elaborate structures which are of service only as evidences of conspicuous waste by the rich and as ocular demonstrations of the unwise expenditures of public funds."

- John Cotton Dana

A C K N O W L E D G M E N T S

To -

Lawrence B. Anderson  
Head, Dept. of Architecture, M.I.T.

William H. Brown  
Associate Professor of Architecture

Kevin A. Lynch  
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- I would like to express my gratitude, for without their cooperation  
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## I N T R O D U C T I O N

A new concept, new horizons, and opportunity have given impulse to this thesis, which in the ideal is an attempt to present a museum which is dynamic, a place to learn by seeing, feeling, hearing and doing; a place where one might seek information and find it; a place for recreation and stimulation; an institution thoroughly coordinated and integrated with the life and needs of the Filipino people.

Times change. That, in essence, is the spirit of science itself. For a long, long period, tragically for the world, museums stood in splendid isolation from the populace, enshrined wealth untold of, preserved cultural lore for posterity; thus were always dormant for the present generation. The world, through the leadership of America, has presently reached the dawn of a new concept. For years, the public has been familiar with the library or the theater but it has been unfamiliar, therefore indifferent, to the museum. Unceasing and tireless experiments and studies indicated that the museum had not as yet defined its purpose, hence conventional and customary arrangements in many museums gave little benefit to people and resulted in waste of public funds and energy and in less opportunity for education and enjoyment. They have also felt that the manner of selection and display of exhibit materials tended to confuse and bewilder the minds of spectators. The meticulous and incessant creative labor that has been invested in studies of this kind led to the construction of new museum buildings which mark the begin-



ning of a revolution in scientific education that has long been brewing; now the museum has become a place of visual education in vital, living terms.

Museologists and architects face new horizons. They carry the responsibility of making what used to be a recalcitrant horse pull the cart of progress along with other public institutions. Cognizant of the fact that making the museum an integral part of the life in a community does not mean building the museum for scholars and students, museum authorities see the folly of allowing the museum to remain to be a store-house, a work shop, or a treasury of science. When money is to be had, the problem is not simply acquisition but improvement. They recognize, above all, that they are answerable to a bridging of the gap between a well-directed, thoroughly hashed theory and a practical, actual progress. Work with museums is extensive, exacting, and never at an end. Museologists and architects continuously have to deliberate upon possible means for the betterment of museum work.

More than any other country in the world, the Philippines can benefit most from the new concept--as The Preliminary Studies will show. As there is presently a move to reanimate the National Museum in the Philippines and as interest has been shown by proper authorities because this "thesis may be of great help in the construction of a permanent building to

house the National Museum,"<sup>1</sup> the planner thought this a great opportunity for service. Be these as they may, the planner does not purport to offer a novel and embellished structure which may well defeat its purpose. This thesis has been envisioned to meet the puissant need of the Philippines for a museum building, planned with a consciousness of the fact that a museum has to be functional and conceived with a safe enough far sightedness. The worth of any living institution depends on its use, growth and advancement. The solution of the problem which has taken this fact into more than careful account, does not represent the caprices of a young designer; rather it has arisen from consistent and painstaking study.

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<sup>1</sup>/ Quoted from the letter of Dr. Eduardo Quisumbing, Director of the National Museum in the Philippines to Mr. Serafin Aquino, dated July 5, 1951.

DEFINITION OF PURPOSE

A reflective view of the museum and museum administration and a careful consideration of the city department store of the first class as a potential museum may easily lead one to believe that humanity can do without museums, that culture can be promoted by the exploitation of the great department stores - into acting as museums. The department store is centrally located and easily reached; it is open to all at all the hours when patrons wish to visit it; it displays attractively the most interesting objects and its collections are classified according to the knowledge and needs of its patrons; it is well-lighted and it changes its exhibits to meet the daily needs in subjects of interest, changes of taste and the progress of invention and discovery. No sooner is the comparison made than other suggestive comparisons come to mind. The dealer in painting has his gallery, always convenient, open to all without charge, with exhibitions constantly changing. On the industrial side, we see that every factory and workshop is a museum in action, and, if it produces beautiful objects, is a living exhibit of arts and crafts.

Stores are constantly made more attractive and more informative, factories are more humanely and rationally managed, printing presses produce better and cheaper illustrations of works of every kind, and the cinema reproduces for us more faithfully the activities of men in all lines of work and in all countries.

The question then arises: does a world which is supplied by mere trade and industry with convenient storehouses of the

world's products old and new, the best as well as the poorest in the industrial exhibits in factories of every kind, and with pictures and texts of amazing beauty and suggestiveness; does a world having all these things need the museum at all?

To this question there can be only one answer. Save for the very young, the opportunities for self-education offered by the street, the store, the factory, the movie and the printed page are quite ample. Any boy or girl who will can gain an excellent education without the ministrations of the school. But on the whole, in spite of its inadequacies, it seems wise to maintain the school and promote education through it.

Any man or woman can worship his Deity wherever he wills--at home, at school, in almost any place where he can meditate. People find spiritual upliftment in the most quiet places. And yet, generations and generations of people have found their way to their churches amidst changing values and attitudes and the church remains to be a powerful instrument in the formation and guidance of values.

Just so with refinements of human nature, are those betterments of manner and feeling. To be sure, these refinements may be attained by any who will attend thereto and will diligently use to that end, the materials always at hand in dress, architecture, shop window, nature, and the printed page. However, in spite of the infinity of ever-present opportunity for everyone's education in the refinement of life and the enrichment of the leisure hour, it has seemed wise to establish and

maintain the museum.

Elsewhere in this study there has been an attempt to show that this museum has been absorbed in one aspect of its work, that it has left untouched its more important and pressing duties. It has built itself an elaborate and costly home, beautiful after the fashion of its own day and the taste of its community. In this home, it has gathered the rare, the curious, the beautiful, and whenever possible, the unique and costly. It has also been pointed out that in the face of the demand that the museum serve its people in the task of helping them to appreciate the high importance of manners, to broaden their sympathies and multiply their interests, in other words, that it play an active part in people's lives--the museum is going through a complete metamorphosis. This thesis has these purposes in view--to stress the importance of a museum in the life of a community and to present a museum that will meet the demands of the times.

P R O G R A M

## M A I N B U I L D I N G

### GROUND FLOOR

#### Passenger Loading and Unloading Area

- a covered portion of the ground floor for the convenience and safety of visitors arriving in cars.

#### Public Concourse

- the larger part of the ground floor which takes care of the flow of visitors from the parking area to the main stairway and vice versa.

#### Concessions

- snack bars or refreshment stands to serve the needs of the visitors from time to time.

#### Gardener's Storage Rooms

- to house the gardener's equipments and tools, such as lawn mowers, hose, hedge-clippers, etc..

#### Equipment Room

- to accommodate cleaning equipment and other such necessary for the ground floor and the surrounding area.

#### Parking Area

- a designated portion for the public cars and a smaller portion for cars belonging to the staff.

### MAIN FLOOR

#### Lobby

- control room for the effective supervision for public and semi-public parts of the building.



- takes account of the number of visitors after they have been received.
- contains the checkroom (which is flexible to accommodate divergent sizes of guests).

#### Sales Place

- provided for the sale of publications pertinent to the museum and its activities, postcards, and souvenirs.
- located in the lobby.

#### Orientation Room

- by providing a place where the museum visitor may find more than perfunctory answers to his questions, the orientation room introduces the museum particularly to casual visitors.
- is closely related to the exhibition space and easily reached from the lobby.

#### Information Desk

- to serve business callers and guide visitors.

#### Classroom

- for class instruction or various educational workshops and group work.
- located so that it can be reached and used separately without involving the rest of the building.

#### Small Theater

- for educational motion pictures.
- equipped so that it can be used for other educational activities, lectures and seminars.

#### Exhibition Space

- occupies the major part of this floor.

#### Special Exhibits

- temporary exhibits or timely offerings of seasonal or news interest.

- calls for an orientation room where literature regarding the special exhibit is provided.

#### General Exhibits

- permanent or relatively fixed exhibits.

##### Cultural:

Hall of Heroes and Great Men

Gallery of Art

- includes paintings, sculpture pieces.

Hall of Costumes

- devoted to a historical presentation of the costumes of Filipinos from the time of Rajah Matanda to the present time; models executed in wax.

Christian Hall

- for a presentation of Christian culture as differentiated from the non-Christian way of life.

Non-Christian Hall

- a presentation of the earlier ethnic groups of the Philippines, of the costumes used by the non-Christian tribes.
- includes exhibits showing the artifacts and implements used by each group.

Industrial:

Mines Hall

Agriculture Hall

Forestry Hall

Fisheries Hall

Habitat Groups of Animals:

- arranged to show classification or morphology or some major principle.

### Toilet Rooms

- to serve the general visiting public and lecture audiences either simultaneously or alternatively.
- situated so that these cannot be easily patronized by the non-visiting public.
- closely oriented to the assembly rooms and the exhibition rooms.

### Storage Space

- for general housekeeping equipment
- located in places convenient to those who use the equipment.

### Stairways

- takes care of the vertical circulation of visitors from the loading and unloading area, the parking area, and the public concourse to the lobby and vice versa.
- connects with the lobby; arranged with grouped flights of steps.

### Corridors

- arteries of travel for people and things.
- may be used for display of exhibits.

### Ramps

- for the convenience of visitors going to the main exhibition rooms from the street and from the bus loading and unloading area.

## THIRD FLOOR

### Administrative Offices

- includes the offices of the director, assistant director, finance officer, stenographers, and clerks.
- includes a conference room.

- closely oriented to the main public entrance so that business callers do not have to explore among the exhibits before they can reach their destination.
- proximal to the education division, curatorial offices and service quarters for close supervision.

#### Curatorial Departments

- study rooms, curatorial workrooms, and live storages.
- has its own preparation rooms... for different departments such as History, Art, Anthropology, Botany, Geology, and Zoology.

#### Library

- department having the care of books and kindred materials, often of photograph collections and lantern slides; a reference and service arm.

- the various parts are:

Librarian's desk- the librarian's work place; center for the circulation, the return and borrowing of books.

Reading Room - space where visitors can turn to serious study and reading and remain undisturbed.

Stacks - placed in part of the Reading Room or in a separate space arranged in two levels.

- provision by which books can be kept within sight of the readers.

Browsing Room - space for the less-engulfed reader, for casual reading.

Toilet Rooms - within easy access of the visitors using the library or the area surrounding it.

Photograph and Slide Files - kept in the library as a reference file; the cabinets holding them are placed as though kindred to the stacks.

Outdoor Exhibits - Interior Court

Fresh Water Lilies

Small Philippine Plants

Sculpture and Geological Specimens

Seats For Spectators and Visitors

## S E R V I C E   A R E A S

### GROUND FLOOR

#### Office of the Superintendent

- adjacent to the service entrance; control room of the ground floor.
- placed physically where the superintendent can see for himself what goes on around him.

#### Packing and Unpacking Area

- space where goods delivered are unpacked and later re-packed for their special destination.

#### Crate Storage

- for delivery crates which may be used again.

#### Employee's Room

- quarters for the force of artisans and laborers.
- within easy reach of the service entrance.
- includes provision for dressing and locker space with a connected toilet room and lavatory with one or more showers.

#### Unloading Platform

- takes account of the sorts of materials and sizes of trucks that are destined to make calls upon it.

### SECOND FLOOR

#### Registrar's Office

- where records of museum accessions and of borrowings and lendings are kept.
- place of pause for museum materials on their way to or from the exhibition rooms.

### Photography Workrooms

- place designated for photographic work; calls for dark rooms, a room for printing, enlarging, and the developing, fixing, washing, and drying of prints.

### Case Storage

- space for keeping exhibition cases when not in use.
- situated close enough to the exhibition rooms.

### General Service Area

- space for special shops, as for restoring paintings, mending textiles, repairing works of art, and mounting insects and animals.

attached to particular shop it serves.

### Washroom and Toilet Rooms

- provision generally for the staff-workers on the second floor.
- washrooms imperative for those who handle the collections.

## THIRD FLOOR

### Preparation Rooms

- special shops and studios for the preparators of science exhibits.

### Tool Room

- for the storage of tools used by the preparators and curators.

### Washrooms and Toilet Rooms

- large sinks with running water and drain provision for plaster and debris.

## FOURTH FLOOR

### Air Conditioning Plant

P R E L I M I N A R Y   S T U D I E S



P R E F A C E   T O   T H E

P R E L I M I N A R Y   S T U D I E S

In recent years, the museum has received increased attention and in its progressive development, the U.S.A. has led all other countries. In a consideration of the history of the museum, however, attention has been paid to the European Museum because it is the ancestor of museums in other countries and a study of its beginnings may help to understand the present state of the museum, in general, its old ills and practical alleviation, and to intensify the search for vigorous features and the rejection of dead characteristics.

The second Period of Reform of the European Museum set fire to the interest of museologists in America and America became one of the theaters of action in the museum movement. The Formative Period of construction that America went through from 1916 through 1942 is here discussed extensively to show what will be the dominant influence over the museum in the Philippines. The culture of the Filipino people has been patterned to a large extent after the culture of the American people; if the museum in the Philippines is to realize its potentialities, it will have to depend greatly on what it can learn from America.

H I S T O R I C A L   B A C K G R O U N D

E u r o p e

A m e r i c a

P h i l i p p i n e s

In Ancient Greece, people sought peace of mind and spirit inspiration in a place they called the Muses' Realm. This is the earliest notion of a museum. Through the years and in different places, the role of museums and its emphasis has shifted variably from the religious to the intellectual, even to the extreme encyclopedic learning. In its present significance, however, the inherent meaning of the word as mentioned above is no longer implied. Presently, a museum refers to a collection of specimens of almost any character and involves the instruction or pleasure of anybody who may wish to make use of its facilities.

Collections owned mainly by private individuals, religious bodies, and by groups of people united by a common pursuit are the foundations of the existing Public Museum. The Economic Hoard collection conspicuously aimed to demonstrate purchasing power to the satisfaction of the visitor. In attention-getting guise, this collection performed the role of a bank and public treasury. The economic hoarders were just hunters for wealth deposits. The attraction is in a possible increase in market value of the hoard rather than in the appeal of objects of interest and beauty.

The Social Prestige collection was directed towards the enhancement of the owner's prestige and not towards the security of the possessor. Here the costliness of the objects displayed is outweighed by the effect it has on people. The social prestige collectors were usually monarchs and nobles

who achieved aggrandizement by displaying their booty from wars in triumphal processions.

In the 15th and 16th centuries, collectors had an ample provision of objects valued for their medicinal properties and their magic powers. Some illustrious persons were anxious to possess objects that would endow them with extraordinary powers--as making old age vanish, or taming a wild bull. The religious accumulated images in stone, wood, or metal because they believed in the miracles of the saints. These come under the Magic collection.

There were collections to express Group Loyalty. Many people traced their "ancestry to a celestial race" begotten of nobles. Their collections included objects connected with their legendary past when humans still enjoyed the near help of the gods (such as tools used by war heroes, paintings, and skeletons that represented the giant race before them). Identification with ancestors enhanced their self-confidence and encouraged ambition. Some collections made the hearts of the people swell with various emotions as they surveyed the records of their country's triumphs and defeats. They fostered a consciousness of belonging to a city state. "Patriotism" in terms of the association of an extant community with the experiences of people who lived in the same area, is an important drive behind the accumulation of classic remains in Renaissance Italy. The ancient cultures of both Rome and Greece were venerated as a priceless legacy and a

heightened sensitivity to the "Mediterranean past" seemed to inspire the men of the Empire. On the evidence supplied by collections, some additional aspects of a spiritual European unity seemed to emerge. There is the loyalty to the Roman Catholic Church. Men surrounded themselves with saints and felt that thence they were segregated from the wicked. There was a new approach to leisure--portraits of titled persons were used to keep alive the awareness of celebrities as common European ancestors.

Collections were used as a means of stimulating Curiosity and Inquiry. There are curious minds which jump from one to another as there are inquiring minds which plan a path and steadily keep along it. Fanciful belief in miracles and thirst for sober information led to cases and tables crowded with an infinite variety of objects. Scientists became collectors, serving towards the advancement of knowledge but the scope of their interest transcended their professional field.

Finally, there were the art collections used as a means of Emotional Experience. These were meant to stimulate comprehension of matters beyond the surface value and to enable the spectator to grasp deeper and wider implications. They were answers to the human desire for experiences that enhance the consciousness of being alive. Collectors accumulated objects of "artistic" qualities which have great capacities for releasing emotions.

The presentation of specimens was not consistent. The Store-room style tended to satisfy the need for safely keeping the stored articles for eventual future use. This implies that the stored articles would be taken out of storage to the room where they were to be used. Hence (1) economy of space, (2) reasonable accessibility of the objects, and (3) lack of interest in decorative display were factors that would satisfy this style of presentation. Presentation according to Facts of Matter is dependent upon classification according to the raw materials out of which the objects were made. General groups were subdivided into smaller units. In the Kaleidoscopic arrangement, the very variety of specimens gathered together was the keynote of the presentation. For their number and variety, objects arranged this way entertain the eye and give people a great pleasure.

The Learned Manner of presentation involved shelves placed along the walls and consisted on one side of naturalia and on the other, artificialia. Objects under each were separated and both the meaning and form of the specimen was taken account during placement. While clarity was aimed at, all space available was utilized as if the exhibition room had been a storage chamber. It seems noteworthy that a library was combined with the collection and a table with books for reference stood in the center of the exhibition. In spite of the light manner and mannerisms of the decorative presentation and, possibly, of the attitude of mind of the audience bent on entertainment rather

than on enlightenment, part of the message would be transmitted and the result would add to a compromise between ruling absolute dogmas and a newly rising unprejudiced spirit of questioning. The striking characteristic of this presentation was its decorative wholeness and its magnificent atmosphere.

The Performance was used as a Framework or Background of Presentation. Objects were displayed so that they were decorative in themselves and at the same time, a part and background of festive gatherings arranged by their possessors. Thus, the room containing musical instruments would at times be turned into a concert room and the room in which armor was kept would occasionally serve as fencing grounds.

Acquisition of specimens may have been by way of gifts or exchange between individual collections. Sovereigns sent ambassadors abroad who acted as agents in acquisition. To a considerable degree, the change of ownership of specimens has been effected under the immediate influence of wars and revolutions or in connection with such violent events. At all times, specimens were acquired by purchase. There was also the traveller collector, who was often a student of natural history and medicine.



Great masses both in Ancient Greece and Rome had access only to exhibits available in the temples and in the streets of their towns. The stress was therefore laid on religious experience and respectful awe for the strange and rare rather than in unprejudiced observation of objects. The desire of collectors to obtain fine works of art by providing artists with opportunities for studying works of famous masters of the past was perhaps the motive which first unlocked the doors of private galleries and cabinets. An appeal to collectors to make their treasures accessible to visitors, to people who could not brave the danger of travel in distant lands was made by A. Olearius in 1674. Only in 1683, however, when Mr. Ashmole presented the Tradescant Museum Collection to Oxford University, was the first Public Museum of Europe formally created.

Then, however, it was intended to be a place of research and not an aid in mass enlightenment. An awareness of the museum as a means of general education dawned with increasing consciousness of the need for the improvement of existing educational standards. Though in theory "public", these early museums for a considerable time were but a limited aid in the instruction of the populace.

From an historical perspective, the new phenomenon, Public Museum, resulted in failure. When the private collections became obtainable to everybody, the Public Museum became a magnified and distorted version of a private collection.

Different types of collections, that of the scholar, the art lover, the patriot and religious believer, became mixed in a single museum and the individual vigorous character of each collection was annihilated. Besides this, the buildings owned by rich people, with gilt carvings, magnificent staircases, and large ceilinged rooms were used to house the museums. These were incongruous with an institution alleged to serve people in their wish to learn and recreate.

The first efforts at reform coincided with the Period of Enlightenment, the years when inquiry became unfettered by superstition. Reform was enhanced by a growing interest in ethnology and an imperialistic policy which strengthened the control by civilized nations over peoples of primitive material culture. The Museum of Science was a means of satisfying the growing interest in natural science. The Museum of Arts and Crafts grew up as a result of the desire for the advancement of industrial crafts by which a country could more effectively carry on favorable trade arrangements with another. The Public Museum in the later 19th and early 20th century was a means to develop civic spirit, to serve as an incentive to action. The Civic Museum developed from the tendency towards making the museum as an aid in the education of school children.

The pressing need to set limits to the expansion of museums led to the trend towards specialization in subject matter. Efforts towards imparting organic character to the museum have been guided by analysis and its contradiction, synthesis. The

analytic approach was dominant in natural sciences and required specimens to be classes according to "genera" or fixed classes and subdivisions. It served the needs of the scholar and man of science. Synthesis claimed that works of art and other products as well were to be treated as "unica" and not wasted by a presentation in series. In museums concerned with specimens other than objects of art, an integration was attempted by presenting the objects in a sequence of evolution or comparison. The unsolved argument as to whether a selected group of objects should be exhibited either in the manner of a "period room" or in the manner of a library led to the plan of combining both principles by dividing the museums into two parts; one accessible to the general public and the other reserved to students. The public museum evolved into a sort of "Everyman's Laboratory."

With the great strides in transportation and communication, the scope of museum activities was extended in two ways. It brought more visitors and sent out itinerary exhibitions. In spite of these efforts at reform, the consequential improvement could not quell the influence of tradition that remained decisive in the manners of acquisition, selection, and presentation. The European museum remained an accumulation of objects acquired in a random manner.

What is called the Second Period of Reform covers the time between the two wars. It involved four theaters of action. In Soviet Russia, there was a period of revolutionary social change. The Russian museum workers created museums that would

act as social weapons in the struggle for the reorganization of society and which would be a means of shaping the minds of people in accordance with the accepted philosophy of life.

Vast accumulations of specimens, still hoards, smaller museums founded by societies interested in a branch of natural science and private collections deserted by their owners at the outbreak of the revolution were waiting to be re-shaped into Public Museums. The re-naming of the former Museum of Fine Arts in Moscow to Museum of Descriptive Art was characteristic of Soviet Russia museology. Museums of informative character aimed to disseminate information so that information had to be both exciting and informative. Many of these museums are primarily laboratories of the scientists-to-be and work hand in hand with schools. The appeal to the general public is fortified by opportunities offered to them to show initiative and cooperation in the course of their visits. Accordingly, the Russian museums encourage differentiation of service by members of their staff and are conscious of the importance of the educationalist responsible for the presentation of specimens to different groups of visitors, as distinct from experts specializing in a particular branch of science or arts.

The purpose of the Fascist Italian Museums was the education of the masses. It was a special kind of education, a subordination of interests to a single master idea: Italy's political mission to regain the position of a world empire as dictated by the destiny of Rome. The "Museo delle 'Impero Roman" and

the "Museo Mussolini" were dedicated to man who devoted to the "imperium" his untiring loyalty and devotion.

In Germany, 1933, the museum workers resolved that museums were directed towards the shaping of an amorphous mass of population into a strong nation. The Fatherland Museum and the Army Museum were important aids in the education of children and in the moulding of young people as members of the national community. Growing Germans were to be imbued with faith in the common destiny of all Germans and with the will to help with all their power to maintain the unity of nation and country, and to generate a mental preparedness for war. Thus, the museum had become an agent for propaganda. The informative value of museums was more appreciated than any other formal qualities.

In America, tremendous work was undertaken between the wars. An American museologist said that the museum had become an American phenomenon developed by, for, and of the people, no longer an abandoned place or storeroom for national wealth. Interest in museums rose steadily, investment in it was doubled and more people visited the museums. Museums grew and multiplied as never before and a deep-seated change came over architecture itself. A main characteristic was the increasing stress laid on its educational purpose as distinct from tasks of preservation and research. In view of this, architects recommended that the museum building should be composed of conspicuously different parts, each serving a

definite purpose and all together forming an organic entity. Enlightenment of the masses is persistently declared to be the first and main task of the present day museum. Someone predicted, as early as the thirties and the forties that the museum will be concerned in its final form as much with man as a sociological being as with his scientific discoveries and his industries.

The Formative Period of construction of museum buildings falls into two contrasting groups. The years from 1916 through 1932 produced museums in the old eclectic spirit of architecture; styles of the past, commonly of adapted Renaissance or Neo-Classical style were made use of. The later years, from 1933 through 1942, showed a general turn to the contemporary style; the West Coast art museums at Seattle and Portland, both completed in 1932, were recognized forerunners of the sweeping change in architectural treatment that came in 1933.

The general adoption of modern style involved rejection of the formal dictates and styles handed down from the past, in favor of fresh consideration for needs of today and efforts to serve these needs creatively in the light of contemporary aesthetic ideas and with the help of modern means. In the place of stylistic forms, as the temple form, the palace form and the church form, were substituted clear expressions of present needs, employing steel, concrete, glass, and other materials including stone, in up-to-date construction, recognizing modern developments in mechanical, illuminating and heating and ventilating engineering. It is to be noted, however, that there are later modern-looking buildings of the thirties that actually deny the modern spirit by failing to pay even ordinary heed to museum requirements.<sup>2</sup> These are reminders that for museums, the years ahead are important years of decision.

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<sup>2/</sup> Coleman, L. V. Museum Buildings. pp. 5-6. Baltimore, Maryland: Waverly Press, 1950.

Features recognizable in the recent museum as a class have either emerged from gradual growth and lately released or new and decisive advances in thought. The most familiar of these present-day features is full provision for efficient work of the staff. One need only recall the older kind of building designed almost wholly for exhibits to appreciate the individuality of the present type with its conveniently placed rooms for the staff. Some museums have proportionately more than others of such provisions, but every museum is advanced or archaic according to whether or not it provides realistically for its workers and their work. One other development is the extension of ways in which the public's points of view and conveniences are considered. Display has been moved to the side-walks. The public information desk is growing into an educational booking office and there are signs that space near the lobby will become a characteristic new place for contemplation, reading, and orientation to the exhibits.

A feature that is conspicuous in all recent buildings is artificial lighting. The architect and engineer are expected to cooperate toward making a day-worthy building and in so doing, they also meet the needs for hours of darkness. Good illumination is important in the organizing of space because museums have been relieved from a very serious deadlock long imposed upon them by skylights. A decided change is the adoption of air conditioning, which gives the planner more chances for untrammelled arrangement of space, to say nothing of raising



efficiency in work and making visits more agreeable to the public. Twenty years ago there was not much of even simple forced ventilation; ten years ago ventilation meant only heating, preheating, and circulation of air; but today, a new public museum that does not have year-round control of both temperature and humidity, not only for public spaces but also for workrooms, may be regarded as a backward establishment.

An important development which has not yet covered all museums is adequate and rightly designed provision for live storage of collection and for the related business of reference and research. Storages of some sort are not new, but indications now point to acceptance of the idea that "enlargeable" space for study storage is an initial requirement of every well designed museum. In fact, there is now modern organization of space which makes possible a strikingly new arrangement--a combination of a horizontal exhibition block of one or two floors near the ground with a vertical curatorial block rising several stories higher from only a part of the ground plan.

Several new characters of great collective significance are from the designer's added freedom. Noteworthy is the transformed assembly place. While the lecture room was merely an allotted space within the walls, it is now a unit of sufficient architectural importance to form a main element in the building's composition of masses. A special place for music has

been provided in many museums. Where a separate music room is not possible, arrangements for music are made in a lecture hall.

Flexibility of the kind that allows for readjustment is another feature that is presently gaining attention. Planners have envisaged a flexibility that allows for functional growth, that is, expansion of the various categories of space without violence to either the appearance of the building or its usefulness. Inadequate funds may call for an incomplete building but only shortness of sight can give rise to a hidebound project. No single general scheme of arrangement has been preferred; as a rule, the site is the controlling factor. Hemmed in city lots force thin buildings to extend upward; while spacious city sites prompt both vertical and horizontal development. Public museums generally fare best if located centrally from one of the larger residential sections.

The National Museum of the Philippines had an almost chaotic career. Since its establishment as a bureau (Insular Museum of Ethnology, Natural History, and Commerce) in 1901, it has been organized, disorganized, abolished and recreated. In an attempt to define its purpose, The National Museum has been constantly changing its name. In 1905 the Bureau was abolished and the Ethnological collections and work were transferred to the Bureau of Science. Archeology, ethnography, physical anthropology, botany, geology, paleontology, and all the branches of zoology became the National Museum Division under the Bureau of Science. In the reorganization of 1939, the Division was made a special unit under the Department of Agriculture and Commerce and was named Natural History Museum. In 1947 by virtue of Executive Order No. 94, it was re-created as the National Museum - merging what was left of the Gallery of Arts and History of the National Library and the original Natural History Museum.

The National Museum faces the same problems it has left unsolved, such as the lack of funds and the lack of adequate space and personnel. Prior to the Second World War, the sum of P 1,500,000 was appropriated for a museum building but the project was not carried out because the appropriation was used for "more immediate needs."<sup>3</sup> In February 1945, all the scientific and

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<sup>3/</sup> The expression is used whenever money or resources on hand are used for another purpose. It is a sort of by-word in government parlance.

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exhibit collections belonging to the Natural History Museum housed in the Bureau of Science building were completely destroyed by the Japanese. Millions of pesos worth of specimens were therefore lost and the loss was strongly felt by the scientific world. As the War Damage Commission failed to allow any amount for its rehabilitation, the National Museum presently occupies partly repaired buildings of the Bureau of Science.

In spite of its hit-and-miss programme, the National Museum endeavored, through its scientific and exhibit collections, to be both a research institution and an educational center. For the year 1950, records show 4,800 visitors and since August 1949, the exhibits of some ethnic groups in the Gallery of Art were opened to the Public. Free demonstrations were conducted - in the preparation of fruit models and the mounting of insects - for school children. Cooperating with the Art Association of the Philippines, the National Museum held six exhibitions under its auspices. It has succeeded in the exchange and loan of botanical specimens. Exchange and loan have been carried on with botanists and herbaria all over the world, a few of them being Dr. E. D. Merrill and Prof. Oakes Ames, Harvard University; Drs. E. B. Copeland and H. L. Mason, University of California; Dr. L. H. Bailey of the Bailey Hortorium in New York; British Museum of Natural History; Museum of Natural History, Paris; Rijka Herbarium, Holland; National Museum at Prague, Czechoslovakia; Royal Botanic

Gardens; Bogor Gardens and Herbarium, Java; Jardin Botanique de l'Etat, Brussels; National Taiwan University; and the Department of Agriculture, Bangkok, Thailand. By loan and exchange the services of foreign specialists were obtained without cost and collections were also enriched.

The National Museum had tried to supply needed information concerning certain phases of natural science but its actual service was negligible compared to what it might have possibly offered. Doubtless, museum authorities were cognizant of the new trends in museum administration but there was still in the Philippines the needless veneration for tradition, the indolent pursuit of trodden paths. The National Museum had not been liberated from the clutch of old ideas, of conventional ways of doing things. Thus, it purported to carry out intensive and extensive collecting of specimens covering a period of five years, the stress being laid heavily on research and in collection. Priceless specimens were gathered and protected in the museums and only a select few could have access to them.

From all indications, the National Museum of the Philippines was inert and if nothing had been accomplished towards its revitalization, it might have undergone a destructive dissolution. Of this fact museum authorities became fully aware in recent years and this awareness made manifest with tremendous insistence, has led to the drive for an allotment of P 13,000,000 for the construction of A National Museum. The Proposed Plan for Rehabilitation states: "A plan for the

immediate rehabilitation of the Natural History Museum is herein proposed. It cannot be too strongly recommended that the establishment of such an institution be made a primary concern of the Republic of the Philippines." The same Plan provides further that "help of American Specialists is absolutely necessary in the building up of the museum" and that "Filipino scholars be sent abroad to train under American Specialists."

Plans are slowly being transformed into reality. Members of the museum staff have been sent abroad for training and to observe the latest developments in museums and museum administration. Necessarily, a new life-blood is being injected into the stream of life of the museum in the Philippines. There is hope, therefore, that the National Museum of the Philippines may rise to a stature which will, from all existing standards, more than merely justify its existence.

MUSEUM PLANNING

## O R G A N I Z A T I O N



The museum is a sort of creature for which the museum building is the supporting structure and covering. A good building ought to have ways of being enlarged as the occupant grows. Museum fields which are broadly art, science, and history, are cultivated as a rule in such different ways that no one museum can well deal with all these fields together. Experience shows that where there is not enough support for two or three museums, the best plan is to start a good museum in the field that has the most support, letting the future take care of other fields. A museum builds with exact knowledge as to the definition of its field.

Different institutional types have correspondingly different kinds of buildings so that planning for an institution presupposes knowledge of a special category of experience as well as general knowledge of museums and familiarity with the particular case. Public museums, which demonstrate much diversity as to size and development and embraces museums in several fields, can be taken collectively as the principal type. Since the public museum is the special interest of this thesis, other institutional types will not need mention.<sup>4</sup> In the interest of planning with foresight, the planner must understand a common feature of public museum organization--the local society; whether it be an art association, or natural history society, or historical society. Society museums are

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<sup>4</sup>/ Coleman. op. cit., p. 12-32.

administratively young museums; therefore, grow up and gravitate toward the public museum pattern when they come to building.

Museum materials for which housing plans are required fall under two main headings, Exhibits and Reserves. Reserve collections, in a broad sense, include much of what is on exhibition as well as what is not since many exhibits are retired on occasion, whether piece by piece or in blocks. A museum would, therefore, require space for both line storage and extended line display. When both exhibit space and storage space become crowded, the problem should be the enlargement of storage space rather than of exhibition space. In principle, exhibits are selective and should be adapted to given space, whereas reserves are comprehensive and may continuously require added space. Space for reserve collections, or study collections, usually called study-storage space, should be planned in a way to allow for adding more space without disrupting the scheme of things in the building. A very serious but common mistake in planning is to relegate the storage problem to the indefinite future without making any plan for its solution.

Exhibits are made up of objects chosen to carry out a plan within a given space. They should not become an uncontrolled accumulation. Objects on display, whether borrowed or acquired for the exhibits, or selected from reserve should be on view for the duration of the plan to which they contribute,

a fact which makes many exhibits temporary in spirit. Temporary exhibits include transient shows in art museums which are of borrowed material, perhaps on circuit from museum to museum; installations of timely interest as selected recent accessions, the object of the week, current news material, even perishable works of nature. Permanent exhibits consist of a museum's own possessions, perhaps including things the museum holds on loan. Space assignments to different exhibits should be planned. The museum's interests should not be subordinated to the donor's plans and every museum should retain the freedom to arrange and rearrange its exhibits, and to retire any part of any exhibit at will.

Administration, under the president and the governing board with its committees, is the job of the director. The director presides over curatorial and library functions and sees to the performance of certain well defined, primarily educational, public services which are assigned to separate staffs. He also exercises several kinds of operating functions which may have their own heads for financial business, membership, public relations, etc. besides the sphere of the superintendent. The director's office with its business appendages should be oriented to the main public entrance. The connection should be close enough so that business callers do not have to explore among the exhibits in order to reach their destination--especially before and after hours of public attendance. In a very small museum where there are no guards,

the office must be placed so that the lone director-curator can take charge of the public's comings and goings.

Among science museums, curatorial departments correspond to main divisions of natural science. There are curatorships of geology and paleontology, botany and zoology, and anthropology; these may be divided into separate departments in very large museums. If an exhibit cuts across departmental lines, the exhibit is supposedly produced through collaboration between the departments concerned. Feature exhibits are placed nearer the main entrance of the museum than exhibits of strictly departmental character. Among history museums, hints of departmental lines are seen in the arrangement of exhibits with chronological and topical divisions on one hand and technical divisions (costume, arms, ships, etc.) on the other, although there is hardly any curatorial organization.

Preparation, or the work of preparing material for the collections and the exhibits is carried on by artists and craftsmen known as preparators in science museums. This will be considered more carefully in later pages.

Registration and kindred functions, partly administrative and partly curatorial are tasks of the registrar and possibly his assistants. The quarters of the registration staff are best placed in the neighborhood of the service, or receiving, entrance.

The Library, which is the department in charge of books and the like, including photographic collections and lantern slides, carries on services for the museum's staff and for the public, including outside work by correspondence. The size of the library differs generally in different fields. Science museum libraries keep what is required for their own taxonomic work and the public's nature-study work. The library should have a public reading room with stacks that can be extended.

Educational work gives the modern museum much of its character and means of support. Museum teaching, if valid, is teaching from collections--not bookish or wordy; the museum relies upon the thing itself--interpreted by words. Four kinds of rooms are needed: a sizable assembly room, classrooms and studios, a place and equipment for the lending collection, and space provisions for the staff itself.

Building operation is the province of the superintendent who is in charge of building maintenance also. The superintendent and his force may make up the largest employee group of the institution. Because they are the seat of building operations, the superintendent's quarters should be oriented to the service entrance. This entrance is typically in the rear of the building and at basement level.

S I Z E   A N D   C O S T

The Size of the building is treated by Paul M. Rea.<sup>5</sup> Taking exhibition floor area of existing museums as his index of size, he plots a curve from which it is observed that size of building increases, but at a regularly diminishing rate, for each step upward in the population scale. Thus, if a place with 25,000 people had say one square foot per capita, a place with a million people would be doing equally well with a square foot per capita.

How to reckon with a community's growing needs, in a museum large or small, is part of the problem of size. All things considered, museum planners might do well to provide as much as they can of the structure needed at once, planning this with a view to extension of curatorial space primarily, and recognizing that perhaps 50 years of life for any part of the building will give that part time to outlive its usefulness.

Distribution of Space between the principal museum functions should be considered at every stage of planning. An architect should have a list of desired floor areas for different uses. A familiar rule of thumb is that in a new building there should be at least as much space for curatorial, administrative and service purposes as there is for exhibition. Storage space when relegated to the basement or the attic, cripples the institution. Perhaps it would be best to allow

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<sup>5/</sup> Rea, Paul Marshall. The Museum and The Community.  
Lancaster, Pennsylvania: Science Press, 1932.

half the total original space for non-exhibition functions, making sure that this half includes the rudiments of a curatorial allowance so placed that it can grow in a natural way, and to increase the space for storage from time to time through additions to the building.

Cost and Per Capita Cost come up when the size of the building is determined. Total cost, which is taken to be the cost of only the building itself, includes construction, fixed equipment, architects' and engineers' fees, and incidentals. Per capita cost is taken flatly as so much per capita, regardless of the size of the community; any fixed rate would be wrong because data for cost tend to follow a curve that drops rapidly for gains in small populations and levels off at a comparatively low rate for large populations. Square foot costs vary widely depending upon differences in time, place, and character of buildings.



L O C A T I O N   A N D   S I T E

Since accessibility to everyone, by easy means of conveyance, if not on foot, is not as feasible as it sounds, the best museum location, after taking into consideration the factors of attendance to say nothing of other factors, is not at the busiest intersection in the center of town but at a point of less flurry on one of the main arteries that a larger number of people follow in going about the business of living, in going from their homes and that children can reach from their schools. The location should be favorable to tourist patronage since people from out of town make up a large part of every museum's attendance. Experience has shown that propinquity to the point of having several museums under one roof is disadvantageous although grouping several museums around a plaza or a Mall is helpful.

Parks are wrong places for museums, not so much because they are found in outlying places but because they are likely to draw people at times of their chief engagement with picnic baskets; besides, encroachments of any kind will have to be met with in parks as a park represents a decision of land use rather than a building use. What a museum needs is a fairly large piece of land in a location that is favorable and likely to stay so for the useful life of the building. For this reason, downtown plots may not be very advisable.

The Lay of the Land on a site determines to a large extent the fitness of the location. It involves a survey of orientation, grade, and configuration of the land with boundaries and

adjoining properties, streets or approaches, nearby buildings, trees and other masses on or near the land, the nature of the soil and of any known rock or water, the whereabouts of sewers, gas and water mains, electrical lines, sidewalks, curbs, and pavements, data on rights, restrictions and easements and all other information. Points of the compass and light conditions will settle problems of studios and offices, even exhibition spaces. The geology of the place may determine construction methods, especially if there are buried masses of rock or undersurface waters.

Relation to Streets, especially as museums move into busier parts of town is important. Libraries know the importance of being close to passing people and of having a busy interior well in sight. Museums are taking this cue; many a museum lobby would gain attention if museums were better placed and many another lobby may be put to livelier use if easily inspected by the public.

Sidewalk Display is accomplished by having show windows looking onto the sidewalk. Construction of such show windows is discussed later.

Parking Problems vary in seriousness, depending upon the location. For the staff, a private parking space is necessary. Parking space should be so arranged that delivery trucks will not damage the cars of staff members by backing into them. Some museums have parking space for the public; some have

vacant land nearby. Most museums leave the driving visitors to shift for themselves.

Site Planning is the architect's concern. The terrace or terraced reflecting pools, here considered as a device of landscaping, may contribute to an academic gain in distinction. Drives and walks should meet both ordinary practical needs and the needs of the design. A non-functional path is as bad as an unsightly one. Quartz gravel on paths cleans the shoes of visitors and keeps down the tracking of mud. Plantings near a building and in open courts may be both pleasing and useful. Greenery should be simple and not too expensive to keep up well. Massed plantings are often employed to screen side or rear exposures of basement.

ORGANIZATION OF SPACE

A public museum building expresses its individuality by its type of structure, it is shaped to the size and nature of the terrain. The architect may simultaneously create an interesting form and further museum purposes. In studying arrangements, determination of space requirements for the different functions and choice of building positions, it is advisable to use the well known plastic method of modeling with shaped blocks, each block representing one of the needed elements of space. Buildings planned this way show marked structural vigor and tend to be visibly different from buildings planned wholly on paper. While attention should be consistently given to requirements of the future and to ways of meeting them within the original scheme of space organization, it is not realistic to plan for more than forty years which is the average life of museum buildings.

The two general ideas of space organization are the radial and segmental schemes of development. According to the radial scheme, the museum would have a central exhibition area containing displays for the general public, with radiating departmental areas for interested visitors to choose between and study rooms connected to curatorial storages at the periphery, for special workers. The segmental scheme organizes space in a series of articulated departmental units to be put up according to circumstances. Each unit would have both exhibits and curatorial quarters and in a very large museum, may very easily develop into separate special museums.

Entrances and Exits Arrangements involve the risk of theft, auditorium crowds, children coming in numbers with skates and bikes. For a public museum, the safest arrangement is to have only one entrance for the public and one for services, with the staff using either at will. In order that the auditorium may be available for independent use at any time, it should have an entrance of its own and its own checking and lounge facilities. A few large museums have other multiple entrance arrangements--some have two ground-floor entrances on opposite sides of the building. Emergency exits must be guarded when subject to use and bolted securely at all other times.

The Main Floor should hold the principal exhibition space. Where the second floor is the main exhibition floor reached by outside steps or by inside steps and elevator, the ground floor has to be given over to purposes that can have only minor claims upon this best public space in the building. The building which has a high main floor and outside steps is discredited by both museums and libraries. Steps to the main exhibits are not sound since they may be hazardous in bad weather if placed outside the building and are a barrier especially to elderly and handicapped people. Even low outdoor steps will give way to ramps because, besides being a real mental hazard, they commonly take up too much space near the entrance. The ground floor may have other uses besides the lobby and main exhibition space. In a very small

museum the office and perhaps curatorial space, the library, even a classroom may have to be on this floor so that the person in charge can watch over as much as possible. Changes of level may force the unloading and reloading of trucks when material is moved from one part of the building to another and may be hazardous for the public. Each exhibition level should as much as possible be in a continuous plane throughout its extent.

The Second Floor use depends upon adjustment between several demands. Where exhibits require more space than the ground floor provides, exhibition space should extend to the second floor rather than to the basement. However, for principal exhibits, the second floor is less useful than the first floor. The second floor is for secondary exhibits, designed to serve students and other purposeful visitors. The space above the ground floor is the natural place for the curatorial function with its need for taking care of expanding reserve collections. Other functions may also make claims on the second floor--part of the business office space, the library reading room, and administrative offices. The second floor can hardly be used for the educational space since it is a little too far from the entrance level for its ready use by classes.

Floors Above the Second are no longer considered suitable for exhibitions in spite of the use of elevators; a sizable part of the visiting public will <sup>not</sup> ascend to a third or fourth floor to view exhibits. Floors above the second give the best place



for study, storage and curatorial work as congestion is least here. As a museum grows, more space than it can get in the basement, where by the way there is competition with every other function, will be needed by the curatorial function. In a building where the curatorial space is above part of the exhibition area, curatorial offices can be kept close together and near their related exhibits.

The Roof has some alluring possibilities for museums especially in a building of one story where part of it is within range of use for exhibition. Living plants and animals could be shown here. In a building of two stories, a setback may be used at the second floor. Higher buildings might have useful roof decks at upper levels.

The Basement is a story at least partly underground. This does not mean that the lower story need be dark as their windows may have lighting wells. The basement is the most congested part of the museum as a rule, however large the basement floor may be. It is primarily the superintendent's floor and its natural functions are those of the services and the mechanical plants. The service entrance is the key to the use of this floor and it must be easy to reach by motor truck. If the site does not give a level approach to the basement at some point where the service entrance can be placed, an approaching ramp is required. The most characteristic service is that of receiving and dispatching many objects to and from the collections and exhibits. This involves unloading and loading, unpacking and packing,

temporary storage of both containers and their contents, registration and perhaps treatment for infection or damage. Equally demanding of space are the shops which must get their materials easily from the receiving entrance. And being the homeground of the mechanics and laborers, it is also the only good place for lockers, shower, and rest rooms for these members of the force, for whom a lunchroom may also be needed.

Below the basement are services that ordinarily the basement would have but it costs a great deal more than to build a story above, besides the difficulty of ground water.

LOBBY AND ADJUNCTS

The Vestibule or anteroom of the lobby is the visitors' first experience with the museum. An inadequate vestibule means an abuse of the lobby, especially in bad weather. The vestibule should then be designed to afford protection from wet and cold when people are waiting for the museum to open. A properly drained roof extension will be very convenient. The doors, outer and inner, are now of glass as a rule and the outer doors may have bronze or other metal exterior grills. This affords a preview of the lobby--front doors should open freely outdoors; they should be hung lightly enough so that men and women can open them even against wind pressure; and they should have automatic closing devices. Revolving doors are generally in disfavor though they are helpful where there is no protected vestibule because the elderly and handicapped find difficulty in operating them and boys enjoy them too much.

The Lobby is the control room and should be arranged for effective supervision of public parts of the building by the least number of people. For keeping track of the number of visitors coming in museums turnstiles, an electric-eye device or a tally register in the hands of the doorman. No method of recording attendance according to the purpose of the visit has yet been devised; this calls for some kind of counting at several points leading from a well planned lobby to different parts of the building. A box office has no longer been required at the main entrance since the general admission charge is almost an anachronism. If fees must be collected,

the place for the cashier is outside the turnstiles or other counters; tickets may be sold in the lobby and collected as the visitor passes into the museum proper. The lobby should be spacious, attractive, well lighted, and well-ventilated; it should not be encumbered with architecture or memorial features. There should be space enough for possible incoming crowds and should seat a number of people at a time.

The check room and the information desk are ever present in the lobby. In a small museum both jobs are performed by one person while in slightly larger museums there are separate attendants assigned. The checkroom is usually at the right of the entrance fairly close to the doors; the checking counter should be long enough for several people at once. The required checking capacity varies according to climate as well as by season and the weather of the moment. For extraordinary peaks of demand as on special evenings, there should be extra space to bring the capacity up to the maximum probable attendance; it may be advisable to have an annex which may be given some other normal use. The check room may also have space for a couple of lendable wheel chairs and even for a few perambulators.

The information desk is ordinarily at the left of the main entrance, and fairly close to the stairway, the passenger elevator and the starting point for exhibits. The business of the information desk can be simplified by having a bulletin board with a directory and a calendar of events including a floor plan of the building. The character of the information

desk depends upon the size of the building. In a large museum, there is usually an open counter, in a smaller museum the desk may look out openly from an office. The information desk may also serve the function of selling publications and postcards. Passenger elevators are important conveniences; some people will walk up one story in spite of a chance to ride but a great many prefer to wait and crowd into an elevator. The number of elevators required will depend upon occupancy conditions. Most large museums have two passenger elevators operated by attendants whereas smaller museums have only one, with or without an attendant.

The principal stairway takes off at best from the lobby within view of the desk; it should be in a convenient secondary position.

Control of offices is an important function of the lobby and must be centered around the information desk. Under no circumstances should offices have a separate private entrance from the outside. Offices should be well oriented to the lobby.

Control of educational space, especially of classrooms, meeting rooms, the auditorium, and the quarters of the lending collection is another lobby function. Part of the traffic to these busy places has to be separated from the stream of general visitors. The attendant at the information desk should be able to point to the nearest stairway or passage.

Control of the auditorium is only partly dependent upon the lobby since the auditorium requires a direct entrance route of its own but an alternative route from the main museum entrance by way of the lobby is suggested. Where the auditorium is below the main floor, a stairway from the lobby is indicated. If it shares the level with the exhibits, a direct passage from the lobby is the best arrangement. If the auditorium is at the right or left as one enters the museum, control of the route from the main entrance can be exercised effectively from the information desk.

Control of exhibition space and control of the library and of curatorial rooms are considered separately.

Public telephones should be provided for the use of the visitors--a house phone at the information desk and telephone booths nearby in the lobby for outside calls. A tasteful arrangement of built-in booths should be made in order to keep the lobby from becoming unsightly by the standard booths of the telephone company.

The sales counter at which publications, postcards and other reproductions of prints may be bought by the visitors is very active in museums. Small museums do their selling at the information desk but some large museums feature a separate bookshop. Native arts and crafts are encouraged by this business. The separate sales desk belongs in the lobby or in a space openly connected with the lobby. If postcards

are sold, there should be space for a writing table. This work should not be conducted within a general business office fostered from the lobby. The sales counter itself requires a display top for books and prints and there should be wall space nearby for further display. The necessary storage closet for stock is best placed behind the sales desk.

For introductory exhibits or timely small offerings, personal or news interest, objects calling attention to the museum's current temporary exhibitions, there should be an allowance of lobby walls and floor space. Care should be taken that when the space is not in use, it will not appear conspicuously empty.

The lighting of the lobby is usually by mixed light in the daytime. The amount of natural light that gets in depends upon whether the lobby is fronted with glass for visibility from the street or has only doors and adjacent panels of glass to let in a token of daylight.

The Members' Room which is by its nature, an adjunct of the lobby, should be off the lobby and it is best to have it open to anyone interested rather than strictly reserved for people already equipped with membership cards.

Toilet Rooms required are proportionate to the size of the building. Most buildings have at least four rooms, two for the public and two for the staff. Separate washrooms for



children are useful in a consolidated educational space.

The public rooms seem best placed in the basement, downstairs from the lobby and if possible connected also with the auditorium lobby so that the room can serve the general visiting public and lecture audiences. Where the two public rooms are placed near together which is good for reasons of plumbing, the doors should be separated as much as possible. Equipment should be standard and strongly put together to cope with rough handling and theft. There is provision for forced ventilation. Staff rest rooms should be near the offices and additional wash bowls placed directly in work rooms save much time. Couches, chairs, first-aid cabinet are usually required. Toilet rooms with showers, locker rooms and like facilities for museum artisans and laborers are provided for in large museums.

Eating arrangements may include a kitchen and public dining room and special provision for employees in a large museum. In the typical small museum there is a kitchenette for the use of the staff. The size and location of the eating place is always a problem as it does not depend wholly upon the size of the building. As to place, the best arrangement yet seen is on the top floor, above exhibits and offices where the setting provided is pleasant. Small museums with only a kitchenette for irregular use need to have this cubicle near a gallery or other space where people can gather. This can be achieved by having the kitchenette give onto the lecture lobby. It is better to have no kitchen foodstuff and waste go through

the museum. This might indicate a basement kitchenette connected by a dumb-waiter with a room above. The kitchen or kitchenette calls for proper construction for fire protection and forced ventilation.

O R I E N T A T I O N   S P A C E

Orientation is only partly effected by the doorman, the information desk; in an effort to achieve almost complete orientation, museum libraries have tried to fit reading matter and labels into the normal course of a visit. In recent years, many museums have skillfully worked out a place for orientation--a space which usually waits to have something done with it. This is the entrance hall, or open place beyond the lobby. Here and there such spaces have been used for introductory and synoptic displays. This space cannot be used for the true exhibition space because it is not suited for installation of exhibits in scale and character. The most profitable use is an orientation center with provision for visitors to sit down comfortably and have a chance to do a little reading about the museum and its exhibits. Because it is the keynote area, it should have a refreshing atmosphere complete with congenial furnishings, including rugs. Here the designer has varied and interesting opportunities in decoration, lighting, and furnishings.

Orientation space must be closely oriented to the exhibition space so that people going the rounds would be encouraged to come in often during the visit; it should be visible and easily reached from the lobby. In a large building with more than one exhibition block there could be more than one orientation center. Function has not been given to axial areas in museum wings. The central part of any exhibition area is not as successful as the surrounding spaces because of the manner of

visitors. Should the central part be developed as a place for rest, contemplation and reading, it could receive the unhurried visitor entering from any side. Precipitate visitors could then take the outside circuit, and leave, or they could interrupt the outer circuit at will. This arrangement will segregate the interested from the casual visitor, a segregation which has long been sought in vain. Orientation might transform the museum from something hard to get any value from into something fully satisfying.

EXHIBITION SPACE

Planners are concerned with both the permanent and temporary exhibitions in order that the greatest adaptation to uses, the shaping of space to need is attained. Temporary shows occur mostly in art museums and are made up of pictures as a rule. Science museums put on a timely show which calls for space facilities. The right place for temporary exhibition space is on the main exhibition floor, at ground level and giving off the lobby. Permanent or relatively fixed exhibitions should meet the needs of the general public and students. The principle of separation in exhibitions is wholly sound. By present standards, the main public displays should be brought into prominence by proximity with the lobby on the exhibition floor. The best space should be divided between public exhibits of all the subjects represented, leaving the second best space for study exhibits of the same subjects. Interrelation should be that there is no confusion. Popular displays demand larger scale planning because they are likely to include large objects, period rooms, habitat groups, and working demonstrations whereas study displays are typically made up of quantities of smaller objects compactly arranged. It has been found advantageous to put the public exhibits nearest to the lobby and nearest to the ground and to put space for student exhibits farther off or farther up in the building as it is a place of detached and purposeful activity.

Division of Space should provide all possible capacity for change. The most rudimentary kind of flexibility comes from

construction permitting removal of any inner wall and without excessive expense. Light, free-standing partitions meet this requirement. A desire for flexible arrangements should not prompt the construction of dividing walls that do not reach the ceiling. Several science museums are commonly using exhibition cases furred to the ceiling to divide space. To assist in making changes the building is customarily planned in uniform bays. Light openings are placed with respect to these divisions. Main air ducts are placed in shafts or between outer walls. Flexibility based on movable rather than replaceable partitions calls for shifting floor-to-ceiling screens or portions, 7-1/2" thick of fabricated frames in standard units, held at the bottom by friction and at the top with expansion screws against the ceiling. This arrangement can take realistic account of the exhibit material on display.

Some people do not accept the idea of adjustability in museums because it easily leads to change for the sake of change, a spirit contrary to the spirit of a museum.<sup>6</sup> This is so perhaps because there is much left to be done through further experiment and the gaps that remain are filled by doubt, which always accompanies uncertainty.

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<sup>6/</sup> Cret, Paul Philippe. "Adjustability in Museums."  
The Museum News, December 1, 1934.



To say "there is no perfect solution ... One age places greater emphasis on one item, while the next reverses the order"<sup>7</sup>, does not only leave the problem unsolved but also reflects unscientific attitude.

Scales and proportions are variable. Ceiling Heights are on the whole much reduced. The more usual things are suspended ceilings or hung ceilings of light construction and separate from structural ceilings. These are an improvement in appearance as they conceal overhead beams. The space above a hung ceiling is useful for air ducts and lighting circuits and for recessing of flush lighting fixtures. Except that the tendency for room size has been to reduce, it is difficult to generalize. Scale for the sake of monumentality has been rejected.

Depending upon the different kinds of buildings and the methods of lighting, there are several types of exhibition rooms. The commonest kind is the simple chamber, which is of moderate size and with an ordinary arrangement. This type is the usual vehicle of exhibits in small museums occupying residence-like structures. The hall with a balcony is the oldest form of exhibition room; sometimes it has tall windows below and above the balcony on one or both sides, and sometimes it has no windows at all. This room began by having several balconies but with one balcony, it became an established type. The clerestory hall or court is a great hall with windows

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<sup>7</sup>/ Cret, Paul Philippe. op. cit., p. 136.

far up on two sides. It may be flat topped or vaulted and with piercing dormers. In art museums, the most popular is the skylighted picture gallery. This is most cumbersome to the museum planner because it involves upper compartments which are costly and difficult to light; collectively, they dominate the building that the architect has no chance to consider space rationally.

The skylighted great hall sometimes takes the place of the clerestory hall. In effect it is a court and commonly treated as an outdoor space in spite of its double-glazed covering. The window garden court, with gravel beds and plantings and perhaps a fountain pool deserves a place in museums. Its best use is for music; even a sculpture show. The exhibition corridor is used like a room, although corridors are by nature only passage ways. Corridors have been regularly pressed into use for display that without exhibits they may even seem empty. Corridors must therefore not be too narrow. The significance of "too narrow" depends upon the size of the building and on whether the corridors will have to be used in moving large exhibits. A last type of room is in effect an allotment of space which is free to be divided when exhibits are installed. Usually windowless, it may have openings for natural light--either separate windows or, more recently, a ribbon of glass which can be screened by a diaphragm. Other special uses of space are cabinets, alcoves formed by partitions, period rooms, and habitat groups. Cabinets are planned in file

along one side of a long space with windows opposite. Period rooms are, to the architect, exhibits requiring space for their installation; these have had to be fitted into rooms that were either too small or wastefully large or wrong in shape. The best provision for these is undivided space, with ribbon windows that can light through antique windows set up near them. Habitat groups are ordinarily installed in space that could have other uses, although they may occupy rooms designed to receive them.

In the Groupings of Rooms in exhibition areas, the planner is concerned with the generalizing of space in the building. While light used to be the determining factor, circulation has a larger part in deciding what is to be done at present. Rooms mean space divisions in these instances and it is well to remember that they may not be fixed. The room-to-room arrangement, with space laid off in a continuous suite of chambers appears in its simplest form, on either side of the lobby or entrance hall. This plan is developed by adding rooms in single, double, or triple file. Extended, the building may take on L, U, H, T or E shape. By joining wings around courts, hollow rectangles and lozenges are produced. This grouping is simple and economical in space. The principal disadvantage is that when a room is closed the circulation of visitors is seriously disturbed if not blocked altogether.<sup>8</sup>

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<sup>8</sup>/ Cret. op. cit., p. 141.

The corridor-to-rooms arrangement or the room-and-corridor arrangement makes possible the accessibility of each room from a passageway. The principal advantages of this arrangement are that any room can be reached directly and can therefore be closed without affecting other rooms, and that the scheme of circulation is clearly indicated to the visitor. Although the corridor takes space, the loss is often recovered in part by using corridor walls for exhibits.

The nave-to-rooms arrangement is centered in a large chamber with doorways along the sides giving into smaller rooms arranged in single or double file and variously connected among themselves. Some elaborations of the scheme which are functional but which have left it hardly recognizable are (1) where the aisles are extended as wide flanking suites of intercommunication, (2) where the aisles are multiplied and the outermost aisle on each side is extended as a series of possible wings joined at their extremities by still another aisle, (3) where the form is that of a windowless axial space of moderate scale flanked by lower windowless spaces divided freely into alcoves and small rooms.

Supervision of exhibition space is also a great concern of the planner. Rooms should be laid out so that they can be watched effectively by the smallest possible number of people. In a small museum, rooms have to be laid out so that the lone person in charge can supervise from his regular place of work. A glass partition gives the director's desk a full view of

public rooms. Larger museums call for special guards, whose number can be reduced if the architect had anticipated the position of watches and had avoided arrangements that make it hard to keep an eye on things.

Circulation, the movement of visitors in exhibition space, takes its pattern from the layout of the building and what is called visitor behavior. Good Routing or precontrol of circulation and excellent circulation must be planned for--good routing promotes full and orderly coverage of exhibits by the visitor who yields himself to the arrangements made for his guidance--but should not be allowed to interfere with free circulation of visitors who would like to move at will. The difficulty with any routing scheme is that it has to make a compromise between arranging for a majority of casual sight-seers and for a minority of interested people. Division of exhibits into public displays and study displays helps to cope with this problem. Another possible way of meeting the problem is to have even the main public exhibits arranged for different rates of progression by providing an outer circuit of rooms for everyone and an inner area for those who care to prolong their visit--the latter area including orientation space for reading and contemplating. The casual visitor's rate of passage could then be as fast as his walking and the interested visitor's pauses could be variably frequently and sustained.<sup>9</sup>

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<sup>9</sup>/ Melton, Arthur W. Problems of Installation in Museums of Art. American Association of Museums, 1935.

To direct circulation, museums have employed various devices--large doorways and vistas, baffle portions, direction markers, master labels, lines in flooring, arrows or shoetracks painted or marked on the floor--but these means are often rather discordant. Types of circulation have their roots in the lobby. Routing within one room is planned as a loop or a looping meander. The best plan is to have two openings for a comfortable circuit; second, that openings should not be on axes; and third, that the exit should not be where it can siphon off the stream of visitors before the stream has passed naturally around as much of the perimeter of the room as the planner hopes to have the general public traverse. Routing in a suite of rooms is difficult to perfect because a connecting doorway is often subject to conflicting demands of two rooms. However, the planner should consider the separate needs of each room. The usual compromise in room-to-room arrangement is one of the doorways balanced to right and left of center, with only occasional axial openings. Rooms that allow visitors through two doorways, a file of rooms through which the visitor goes in one direction only, double or triple file of rooms with interconnecting doorways make for poor coverage. However, a triple file can be made into what comes close to a corridor-to-rooms arrangement by emphasizing the center file as a passage. Routing in corridor-to-rooms and nave-to-rooms groupings if strictly held to, calling for a branching route, thus rooms are dealt with individually. But where inter-

connecting rooms or self-contained units are entered from a corridor or nave, the problem in the room arrangement is again met. A new scheme has been developed. Here the exhibition space is in one narrow gallery, three-quarters of a mile long, coiled into a spiral ramp ascending through nine turns. This runway is reached at each turn by elevators with their shafts encircled by a tight spiral of "fast" ramp. The visitor can thus begin at any level and go as far as he wants to in either direction.

Interiors of exhibition rooms should not compete with the exhibits. Columns, pedimented doorways, heavy cornices, obtrusive details, and ornamental fixtures of all kinds are out of place regardless of the style of the building. It is to be remembered that buildings in modern style do not give occasion for decorative trappings. Contributory decorative devices to assist exhibits are popular. Membering of walls or moldings may help as on long walls with certain permanent exhibits but generally, unbroken stretches of wall are desirable. Breaking of vertical height by horizontals is no longer necessary because ceiling height is now reduced. People used to think that exhibition rooms should be finished with no more in the way of color than with architectural ornament. Presently, noncommittal gray and buff walls are adopted only when the architect does not know the curator's plans or because repainting will be done for changing installations. Colors that harmonize in the exhibits, restrained or vivid depending upon

the purpose, are naturally sought. Different colors are employed from room to room or a room may often have combinations of color. Room color and furnishings should take account of lighting. Paint cannot cover up spectral deficiencies in artificial light but the color of a room can quash the most perfect lighting.

The color scheme can detract or contribute to the scheme of proportions. Light ceilings look higher and light walls look farther apart. If a room is unsuccessful in proportion some of the trouble may be merely in its finish. In science and historical museums, murals are made to contribute to the exhibition story.

Wall finish depends upon the use of the wall. For walls to be used for hanging pictures, the usual construction is of wood sheath covered with fabric or ordinary plaster on cinder block. For a special purpose, walls are sometimes surfaced with wood, with or without finish. Composition boards and plyboards, in panels bounded by wood strips are much in use. For permanent walls of greater elegance, stone is sometimes used in exhibition rooms in limestone, marble, or traverture are most familiar. Stone, however, is usually an exterior material which, if used for walls of spaces more intimate than the vestibule, is likely to chill the spirit. The gallery wall of wood faced with fabric has no substitute but has a few variations. Experience has shown that paint over the facing fabric simplifies things. In fact, several museums have put the burlap directly onto the



wood sheathing, attaching it with glue and painting the surface at once.

In painting exhibition walls, a synthetic-resin-bound, water paint is best as it is quick-drying and has little odor. It can be applied in many coats without contraction and cracking. A plain coat may be used but mixed effects are often produced by spattering or mottling one coat over another of different color.

A hanging rail in the form of a flush channel should be provided above every exhibition wall as objects sometimes have to be supported by wires even where other methods are usual. The inset channel may be at the ceiling line in a room with a comparatively low ceiling or it may be at the top with the exhibition zone in a higher room. Incidentally, the slots of all channels should be stuffed with paper during construction to keep workmen from inadvertently filling them with plaster. Drapes are employed as background for free-standing objects, or as curtains over elevator doors or other unsightly parts of exhibition walls.

Doorways of exhibition rooms should be free of ornamental trim. The reveals, where light switches are found may be finished in plaster with metal corners to prevent chipping. The best size for doorways depends greatly upon the kind of objects in the museum, as well as upon the size of rooms and the character of the building. Large museum objects, large assemblies, habitat

groups and big pieces of plate glass make excessive demands for clearance. Doorways designed primarily for the use of visitors usually have a height of eight foot. The type of doorway that extends to the ceiling, as though it were a space between the edges of two screens is consistent with modern interior design of museum installation and is likely to be adopted. Sliding doors which disappear into walls, provide the simplest way of closing rooms for reinstalling exhibits or other reasons.

Ceilings with exhibition rooms are usually of hard plaster painted near-white. Acoustics are not much of a problem in exhibition rooms as a rule because proper flooring absorbs foot falls and exhibits help to break whatever sounds there may be.

Flooring presents many problems because different parts of the building require different kinds of flooring. Exhibition room floors should be of good general appearance and of suitable color and tone; while they should be resistant to denting and wear, they should be soft and resilient underfoot; and they should be economical to install and maintain. They should be safe for old people. Color and tone should take several factors into account--the nature of exhibits and the desired general feeling. Because glossy surfaces set up reflections, too dark surfaces may cause contrasts in brightness that interfere with seeing, and too light surfaces may produce excessive brightness contrasts, it is advisable to make floors a little darker than the walls. Decorative floors not only take attention from the exhibits but also tend to be troublesome generally.

Variety of flooring is good and it is best achieved by change from room to room, or from one department of exhibits to another, or from lobby or court or corridors to exhibits. Concrete floors are more appropriate for nonpublic parts of the building which do not need other floor covering because although they are low in cost and serviceable, they are hard turning, noisy, and unattractive. Terazzo, a flooring made with small marble or granite chips bonded in special cement, is durable and easy to clean. Although it is rather noisy, it is pleasing in appearance and capable of various ways of finish. Marble, a material both durable and attractive to behold is much used in lobbies and corridors and for stairs but it is not found for intimate exhibition rooms because of its austerity, too light or too dark, its shininess, the noise and fatigue it sets up, and its costliness. It is also very slippery when wet. Slate is used for courts or concrete halls and corridors very satisfactorily. Ceramic tile is cold and hard and unadaptable for exhibition rooms. Glazed tile does not wear well underfoot and too noisy for corridors. Ceramic mosaic is commonest and available in a great variety of forms and colors. Asphalt tile and flooring, somewhat resilient, easy to maintain, good in appearance, durable, and inexpensive is an all-purpose flooring. Easy to dent but resistant to moisture, staining and corrosion; fireproof. This would find most popular use. However, because it is hard and because of a desire for a richer appearance, it has not been commonly used.

Cork tile and carpet is commonly found in library reading rooms and other rooms where some public use is expected and silence is very important. Cork is elastic and soft. It is least tiring and least noisy of floorings but it dents and is easily stained. Rubber tile and flooring is used because it stands up better than cork and is softer than asphalt because it is not "quite right for public spaces"<sup>10</sup> and it is not cheap enough for extensive use.

Linoleum is relatively popular because it is serviceable, resilient and silent, warm, cheap to install, and easy to maintain. It does not wear well under case legs so that it is not used where there are cases and where traffic is light. Wood Floors--over concrete floors with fire-proof buildings--are common in exhibition rooms. Under ordinary demands of service, wood has no satisfactory substitute. If properly laid, wood is springy and silent. Under furniture, it does not dent and does not readily break objects set upon it. Waxed wood is attractive and glossy but not slippery. It can be depended upon to hold its color and tone. Woven carpet is expensive and hard to maintain but it makes for a congenial atmosphere and lends variety.

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<sup>10</sup>/ Coleman. op. cit., p. 153.

A S S E M B L Y   R O O M S

The auditorium, or lecture room is designed primarily for illustrated talks and motion pictures. The size of the community may give some indication of auditorium seating requirements. It is essential that the assembly hall be usable without opening other parts of the museum. The lecture hall lobby gives service in checking and retiring rooms so that although it has no secondary use, it must not be too small. The lecture vestibule and doorway must be planned with concern as to the probable maximum crowd and weather protection from curb to vestibule. For use of outside organizations, there is a small box office at the direct entrance with the lecture hall. The auditorium proper is at best unbroken space with width somewhat more than half the length. The floor may be level or pitched depending upon the uses--a level floor for receptions and even exhibits but a pitched floor means a room fitted out with fixed seats for specialized appointments of an auditorium in any setting.

To control lighting completely, artificial lighting is best. Indirect lighting is usual and one of the best ways of providing for it and good acoustics is achieved by a scheme of non-parallel walls and sloping ceiling in acoustical plaster with overlapping cones above and in the sides or both. Warm color schemes have been adopted.

Seating arrangements are planned to meet the requirements of the building laws as to distance between rows of seats (32 or more from back to back), the number of seats in a row

(14 between 2 aisles, 7 between an aisle and a wall) and other particulars. Experience shows that not more than a dozen seats between aisles and not more than three seats next to a wall are better than the full allowances with the law. Fixed chairs of theatre type, comfortable and of good appearance, upholstered in leatheroid material and not drab in color are the rule. Museum architects stress the importance of comfortable chairs.

Exits should also meet building laws. Some auditoriums give at the sides onto ample passages which in turn communicate with the regular channel of coming and going. An open court can be used as a promenade. It is important to have the auditorium capable of being cut off from other parts of the building.

The fireproof projection booth is an under-writers' requirement for showing of standard motion picture films. The booth should be spacious and well ventilated; it is advisable to have doors to both the auditorium and the auditorium lobby and these doors must have strong locks. The booth requires a two-way telephone connection with the lecturer's desk. A separate vault for film storage is desirable.

The platform or stage is ordinarily arranged for lectures and motion pictures only although some museums have the stage fully equipped so that it may be used for educational activities as well as for music and dramatics. A theatre group is provided for by large wings and lighting arrangements. Plat-

form equipment, unless the room is very small, should include a voice amplifier, connections for signals, beside the telephone to the projection booth. For lighting, an interchangeable plugging system makes it possible to put any circuit or combination of circuits onto the dimmer control. A few science museums have platforms equipped for laboratory demonstrations, opaque-and-micro-projection. It is to be remembered that table demonstrations require all seats to look down on the lecturer's table.

Backstage facilities include dressing rooms and toilet rooms but museums have backstage arrangements that put its dressing rooms where they can be used alternatively for other purposes.

The Place for Music is not necessarily the auditorium. It may be a patio or other outdoor space or an inner garden court as the weather allows. A museum garden court should certainly be planned for music. A modern garden court should be planned to give a clear view from all points and also to have the best possible acoustics. Part of the court would be designed to serve effectively as a stage with adequate backstage facilities, another part for seating or there would be studied areas of rightly chosen greenery so laid out that the whole audience is not obstructed from the stage. This could be a delightful place for strolling and repose. Lighting is natural daylight.



E D U C A T I O N   D I V I S I O N  
A N D  
C U R A T O R I A L   S P A C E

effective  
For the work of the division, it should not be cut off from the rest of the building. It may be a space in the basement, freed as it should be of curatorial use and of the library and business offices or a mezzanine floor consisting of a circuit of rooms around the upper part of the ground floor's central exhibition space. At whatever level, it should be easily within reach from the lobby by way of a free passage. If this route must ascend or descend, there should be an ample stairway placed for the case of supervision from the information desk. It is important to remember that some part of group instruction must extend into the exhibition rooms and that ready access to the exhibits is important too. The amount of space depends naturally on circumstances--10,000 square feet, not counting an auditorium and space reserved for expansion is the size used by large art museums. One Science Museum at Rochester has 6,000 square feet including space for the lending collection.

Classrooms and Studios are called for in greater number in well-developed art schools--for painting, sculpture, and other arts. In a museum one room or its equivalent in available space is sufficient for instruction of classes--and laternatively for use by other small groups. Separate rooms for children and adults are much to be desired if there is enough space for this.

Classroom equipment should be simple and flexible. Folding chairs are best and there should be a place for storing them

perhaps piled in rolling dolly racks. Tables may be of knock-down construction. A blackboard and shelving all around is useful. Recessed cupboards should have flush doors. Radiators are best recessed under windows. Shades should be tight-fitting and opaque. Natural lighting by windows at the side of the room and semi-indirect artificial lighting are best but the lighting circuit should include a dimmer. Flat walls, unbroken by juts and furnished with composition board to take thumb tacks must be painted to give a surface suitable for projection. Linoleum is satisfactory for flooring.

Studios are especially equipped, fairly compact, not long and narrow, and should have north light. Large windows and provisions suggested for classroom plus a monel metal or soapstone sink with a plaster trap in the drain are required for the studio.

Accessory rooms as special toilet rooms for the accommodation of a great number of children, a cloak room which provides a hamper for the trappings of each class and locker rooms for art students.

The Lending Room is the center for visual aids and distribution and found more commonly accomplished by science museums. Here teaching material is made ready and lent out to teachers. Very active service in lending call for stock rooms, special shops, offices, and perhaps trucking facilities. Because of the constant going and coming, loading and unloading, of

material in the lending collection, the reading room may well be near the shipping entrance or arrangements should be made so that shipping out is easy. It should have space for counters and other handling arrangements, flanked by banks of open shelves.

Junior Museum Space within the public exhibition space or the museum is familiar. Several Junior Museums have an exhibition gallery, a library, a motion picture theatre, a lunch room and the necessary checking and washrooms. A Junior management usually makes for a more interesting display.

Growth of collections has been met in recent years by enlargement of curatorial space for the care and use of collections not on display. Live Storages or study storages are so called because they make collections available for reference work and research. Science museums practice Study Storage in a serious way and they have steadily increased the proportion of curatorial to exhibition space in their buildings. Construction of a live storage is a matter of layout and should be designed to give its contents deserved protection and it should be capable of being locked. Artificial lighting, air conditioning of all parts of the space is important for the racks, trays, and shelves. A refrigeration room may be needed for cold storage of materials of science which are subject to attacks of pests and are quick to deteriorate. Fumigation is not carried out directly in storages because of the impossibility of exhausting all dangerous gasses. Live-curatorial

Storage for exhibition cases and screens while they are off-duty may be a part of the basement near the freight elevator. A small temporary storages may well be provided near each exhibit unit, close to the registrar for things passing in and out and at the director's office for objects of exceptional value under consideration by the outsiders. Dead Storage is not a part of a live museum because objects which call for preservation in the dark and sealed from dust and dampness and practice, which is usually called dead storage, is a matter of live storage in special containers or wrappings.

Curatorial Suites are made up of study rooms, curatorial work rooms and live storages so that the planner should relate each curatorial suite to the corresponding exhibits. The study room has to be large enough for the maximum number of uses and should have folding doors or screens to reduce the space for easier supervision or the least number of people. In some museums exhibition galleries are at the front of the building and a study and well-equipped storage with connected curatorial rooms are found at the rear. To cope with the increasing meaningful collections, architects should provide at best the rudiments of a suite, with live storage that can be extended properly.

The Place in the Building that is best for curatorial space is indicated by a plan which might have live storage extending in one direction from the lobby and exhibits in one or two other directions with offices adjoining the lobby at the meeting

point of these spaces. This suggests that study and curatorial rooms together with the entrances to departmental storages be placed where visitors can get to them easily from the lobby. Two methods of relating curatorial and exhibition space are used in recent practice. One divides a compact wing longitudinally. The other puts exhibits on the inside of a unit and surrounds them with workrooms and storages. If the planner adopts the idea of using for orientation the central space in any unit of the building, then a study room might occupy the part of this space nearest to the lobby, curatorial offices might be above, and storages might be at still higher levels.

Location of Offices in the building should be planned such that business visitors should not have to be privately conducted nor should they be sent exploring through the building in order to reach a member of the staff. The main entrance is the approach to administrative space and the route from the main entrance to offices should be under control in the lobby. The path of offices from the entrance should be short and direct. Some museums have its public relations offices on the main floor, front, or its business offices on the second floor, front. From the offices it should be easy to reach the educational division, curatorial offices and service quarters.

Rooms Required for administrative work are the board rooms for the trustees, the director's office and other offices like the assistant director, finance member, membership secretary, editor, and public relations' head, each with his helpers. It is suggested that the board room be made a part of the director's office. Where it is separate, it has to communicate with the director's office and should be planned for a general use as a room for meetings including luncheon meetings. The work with the board may require wall space and shelf or counter space for display of a few objects and a nearby vault. The director's office needs a separate outer office for secretarial work and reception. A small toilet room between the office and board room is convenient. Offices for outside organization or political functionaries is advised against very strongly.

The smaller offices mentioned above should be modern, ample,

and efficient work places, equipped with proper closet and cabinet space and convenient toilet facilities and wash bowls for the staff. Acoustically treated ceilings, air conditioning, general lighting and for storages, local work lighting should be the rule for these offices.



MUSEUM LIBRARY

The library's place in the building is best determined by the demands of public convenience and of staff conveniences. Public use calls for proximity to the lobby, thus the ground floor and staff use indicates the second floor if curatorial quarters are above exhibits. Special arrangements have meant departmental branch libraries or an entirely separate research library, or cubicles in the library for staff use.

Relationship between parts of the library should be highly functional and well knit. In a small museum the reading room, the librarian's desk and workplace, and the bookstands are all inside one room. In large museums there are likely to have separate but connected spaces.

The Reading Room should try to give each reader twenty-five square feet of floor space. It should be lighted by ample windows in the daytime, but natural lighting does not remove the need for adequate artificial lighting. Each reading spot should have a direct place lighting. Flooring is commonly linoleum. Stacks are standard library bookstacks placed in part of the reading room if only a small installation of shelving is required. They may be in a separate space and arranged in two or more levels. Provision for expansion of stacks is important. Space allowance must be had from the start. It is important to determine as nearly as possible how many books a museum is likely to acquire.

Photograph and Slide Files are often in the care of the

library. They are for lending largely to teachers for class-room use. The space set for these in required filing cabinets may well be situated as though it were kindred to the stacks rather than to the reading room, but it should not give all comers easy access to the bookshelves.

S E R V I C E   Q U A R T E R S

Housekeeping services of the museum, such as supply, maintenance, shopwork and moving, are under the control of the superintendent who is responsible for the conduct of services in the building.

The Service Entrance leads directly to the receiving room with a packing and unpacking area which is the distributing point for the entire building. It requires a doorway for the use of service employees, delivery men, and other persons entering on foot and also a freight portal for the use of trucks. The loading platform should take account of the sorts of material and the sizes of trucks that are destined to make calls upon it. It should give handling space at the tail and also at the side with the truck and should be horizontal with a narrow flight of steps leading to it from the ground for the use of people on foot.

The Receiving Room is a focal point to which incoming shipments come for unpacking and distribution within the building, and outgoing shipments go to be packed and sent away. Other rooms should be oriented with it are the superintendent's office, the temporary storage room for crates that are saved for return of their contents, and the registrar's quarters in which museum objects coming and going are recorded and kept for a time, perhaps. The Receiving Room and the freight elevator should lend themselves to movement of materials throughout the building. There may well be a straight line of flow through the service entrance and the receiving room to either the elevator or a

service corridor. The floor area has to be judged by the nature and program of the museum as well as by size of the building since large objects take up much space in handling and temporary exhibitions mean many boxes to move. The receiving room and all work areas around it use general natural lighting by windows and also artificial lighting for work. The floor may be of heavy asphalt sheets or creosoted wood blocks laid on end grain. Fire-proof construction, proper care and disposal of waste, burglar protection, sprinklers may well be provided for the receiving room.

The Superintendent's Office, adjacent to the service entrance is the control room for all that happens here. A guard's desk may be necessary in a large museum but in most the Superintendent is placed where he can see for himself, through a window or glazed partition what goes on at the entrance. In the receiving room for service employees, there should be a time clock and a bulletin board outside the superintendent's office.

The Freight Elevator at best situated beside the receiving room should be large, slow, and powerful and should be operated by push button. It must squarely reach all levels to which its loads might have to be taken, not dependent on a ramp to finish its work at the bottom or top of the shaft. The Elevator shaft, instead of opening directly into exhibition rooms, may open into an intermediate lobby. This also helps appearances.

The Registrar's Quarters should be oriented closely to the

receiving room and also arranged for complete closing under stout lock since it is the place where records of museum accessions and of lendings and borrowings are kept. There must be space, for examining objects and assembling fairly large group of things coming or going, a place for office work, and a safe temporary storage place. The Registrar has usually one small outlying province--the Fumigation center, which is at best near the roof.

Service Corridors are arteries of travel for people and things in the basement. A distributing system to all parts of the building is facilitated by freedom in this passage and unobstructed passageway. Best of all devices concerned to simplify this is the service routing that leads straight away from the receiving room, past the registrar's room, past the service elevator to the rooms it must lead to most often, namely, the carpenter, paint and mechanical shops, etc.

Photography Workrooms are now placed by choice in the basement where natural light can be excluded and the photographer's work carried on by more easily controlled artificial light. They should have air conditioning and careful guarding against vibrations set up by the mechanical plant. Dark rooms require appropriate sinks and counter spaces, besides places for the usual pieces of apparatus, and shelving for supplies. The File of photographic negatives that have been exposed is at times kept in the educational division but a better place is near the photographer's studio, where drawers and cubbyholes

are standard equipment. Laboratories for examination of paintings and other objects by chemical and special photographic means is more often found in art museums.

Shops, whether as a room in a little institution or as a ramified department of work spaces in a large institution, are required in every museum. The principal kinds of shop work for which provisions are needed are carpentry, painting, and finishing, machine and sheet metal work, and the various shop processes that go with plumbing upkeep, steam fitting, electrical maintenance and the care of other plant and structural installations in the building. Under any conditions, the size of the shop area can hardly be less than 500 square feet. The best place is likely to be on one flank of the receiving room. It is strongly suggested that workshops be kept out of a sub-basement. To minimize fire risk, paint storerooms should be placed far enough, shops should be isolated with extra fire-proof construction and fire doors, and sprinklers should be kept in the lumber and paint storages. Air conditioning, general artificial and natural lighting, and wood flooring in less heavy demand for service are excellent provisions. The Equipment of shops should develop from the needs as they are felt than laid out far in advance.

Preparation and Restoration Rooms collaborate with the curator's rooms since they are the special shops and studios for preparers of science exhibits, and for restorers of art exhibits. Some of these rooms like those of the technicians, artists,



and craftsmen are located in curatorial suites, others like the heavy and often noisy and litter-making crafts like upholstery, plaster molding, and mounting of vertebrate fossils had better be in the basement with other heavy operations. Some shops have to be isolated, as the tannery and the macerating room in a science museum; the character and the work may even suggest a shed at some little distance. Cleaning skeletons by dermestes beetles may well be completely banished lest the beetles eat into the collections.

The Printing Shop may be a place for a small hand press used to make labels and other simple jobs or it may turn out books and serial publications. If it takes a big size, the basement is a good place but ordinarily, any place would be serviceable.

Other Service Storage Spaces as for restaurant supplies, janitor supplies, office supplies should be put in places convenient to those who use them. Quarters for the force of artisans and laborers should be easy to reach from the service entrance where checking in and out takes place and should be arranged in keeping with the number of people employed. Separate accommodations for men and women of the force should include dressing and locker space and a connected toilet room and lavatory with one or more showers, even an eating and smoking room.

Living Quarters may have to be provided for an employee in residence at the museum because there are museums at which

anyone from the director to the watchman lives on the spot. In several museums, the superintendent has an apartment provided. The Garage is optional for those that have a parking space for museums' delivery truck and other cars.

Museum designers seem on the whole to be victims of the sort of progressiveness that tries to advance by modernizing things of the past rather than by pushing aside the old and making a completely new start. It is more sound if observers would spend time making general observations in leading cities, taking note of latest buildings and their devices to solve problems in illumination.

Mixed light, that is, light coming partly from the sun and partly from lamps is what we are used to during daylight hours. Both natural and artificial ingredients are requirements recognized in museums as well as most buildings. However, science museums now want only artificial light in their exhibition spaces. Natural means are unsuited to the varied requirements of didactic display and of case installation; projected science museums block out all daylight from exhibition space. Some curators show a preference for "living" in the sense of changeable, natural light as opposed to "dead" artificial light in wanting to see their exhibition pieces in different character at different times. The museum designer's task is to get the values of both natural and artificial light without too many of the disadvantages of either.

Room Lighting and Object Lighting differ in purpose. Room lighting aims to make people feel at ease and provide conditions under which object lighting can be accomplished with success. Object lighting proposes to show objects clearly

and in their full character. Room lighting implies natural light at times of day when nature offers opportunity for this; object lighting involves artificial light at all times for the major part because there is no other way of adjusting intensities in all parts of the room to requirements of the eye and of giving highlights and shadows to bring out texture and three-dimensional form. An abundance of light does not solve the problem of both room and object lighting; what counts is the relative brightness of room and object. Each exhibition space must be dealt with as a whole in order to achieve results that neither general or local lighting can get separately.

Illumination and brightness, produced by light falling upon surfaces and light reflected from them, requires equal attention as illumination without brightness is futile. The relation between illumination and resulting brightness depends upon the character of the surface lighted, expressed in terms of reflection factor, and upon whether the surface reflects diffusely like blotting paper or sharply like a mirror. Contrasts as well as the level of brightness are equally important to seeing; too much contrast is bad because the brighter surface by forcing the pupil of the eye to contract, makes the less bright surface hard to see. The best brightness contrast is approximately 2 to 1--the object twice as bright as its background. The intensity of illumination varies as required by the character of the materials displayed. Successful museum lighting demands a correct relationship

between room and object brightness which can be obtained by the presence of separate object lighting.

The Factor of Position of the Light Source or the light opening or luminaire for the positive purpose of placing light as required, rather than the negative purpose of preventing glare and reflections of glare has been made more successful by several factors which are newly used in lighting calculation-- improved lamp, prismatic lenses, successful diffusing glass and the advent of a modern style with its free and direct meeting of actual requirements. In recent years, the difficulty involved in mixed display which calls for both the use of skylights or high windows for wall displays with vertical reflecting and of low windows for table displays with horizontal surfaces has been met by the development of artificial means that can light exhibits acceptably and further, of giving windows a specific task that they can perform acceptably. We note the modern trend of building windows in unaccustomed places in the walls.

Windows, for the purposes of the present museum, tend to be less and less important. While windows are unrivalled in their capacity to give people reassurance by letting people look out and to make favorable conditions for artificial lighting by providing an admixture of natural light during daylight hours, their use for letting air and light into buildings is now outdone by air conditioning and artificial lighting. The ordinary window-lighted room has been found

advantageous in many ways but it is to be noted that under some museum conditions the accustomed uses of windows are still good. Experience has seen new uses for windows, however--Ribbon windows, which are placed high with their sills way above eye level and usually eight or more feet from the floor are most useful in rooms with comparatively low ceilings. This new arrangement admits as much light as windows of twice that height spaced in the usual way and gives more uniform room lighting as it removes the possibility of contrast between bright openings and dark areas of wall. This new method of using windows evolved out of hesitant uses of natural lighting, which involves corner lighting and end lighting.

Corner lighting is most useful for a room of moderate size; it requires only one window located at or near one end of a long wall, in a modern building this window may extend from floor to ceiling. End lighting is a scheme by which the daylight enters one end of the room--through a short wall, rather than through a long wall in the customary manner of fenestration. Both corner and end lighting have opened the way for organization of space according to functional requirements rather than by the dictates of one or another method of top lighting that called for a low building.

For other devices for effective lighting by windows, we have diffusion, which is accomplished by the use of diffusing glass that is able to break up glare and by diffuse reflection from the ceiling and walls of the room. Screening with

drapes, Venetian blinds or diaphragm controls light from hour to hour as outside conditions change or from time to time as exhibit requirements change. Venetian blinds are the best devices for adjusting window light as they can regulate the light flux through every square foot of window; they reduce the light that passes and simultaneously throw part of the light to the ceiling and diffuse part of it in other directions. Drapes decorate and cut off a window when its light becomes troublesome or there is darkness outside. Diaphragms to reduce light openings may be entire walls of glass with flexible inner screen walls with proper openings.

Insulation of wall openings, either by double glazing or use of blocks or insulating panes, minimizes heat loss in winter and heat gain in summer and prevents condensation. This may be accomplished by double windows, insulating glass and glass blocks.

Clerestory windows are both instruments of room lighting and parts of a useful architectural feature. Since they look out from the top of any high central space on the roofs of flanking spaces, the natural light they admit serves well in the contributory role which belongs to natural light. An important merit of the clerestory is that it rids planners of the treatment of a central court or a high sky-lighted space.

The status of Skylights has changed. In the past, they came into common use for galleries of paintings because they could flood a room with light and yet leave all walls free for display.

They were not advantageous but they held their field by default. In modern times, however, arrangements that cost much less than skylights have been encouraged, since natural lighting which the skylights offer has been relegated to a contributory role. The cost of sky-lighting is far beyond the means of most museums and should be beyond the means of other museums that have great work to do with their money.

Monitors and Inverted Monitors have been devised to light gallery walls without overlighting the floor but they are unsightly and they do not always lend themselves to rational organization space. The monitor is a large rectangular lantern crowning a top-story room and is formed by having the central part of the ceiling raised above a band of windows. The inverted monitor would be a sort of box hung from the ceiling of a top-story room, with windows in each side of the box giving light to the wall at the same side of the room. When one notes how effectively artificial fixtures of simple design can deliver light from the ceiling and how easily daylight can be added in other ways, one can readily see how these involved devices are destined to go.

The Cost of Lighting of any kind depends in part upon the particular means employed. Luchiesh and Holliday report<sup>11</sup>

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<sup>11</sup>/ Luchiesh and Holliday. "The Cost of Daylight."  
Transactions of the Illuminating Engineering Society,  
p. 130-133, 1923.



initial costs of construction for natural lighting to be from 80 to 130% higher than that for artificial lighting and the operating costs to be something like 135% higher than for daylight.<sup>12</sup> With natural and artificial means used in combination, however, both the lighting and heating costs can be kept in moderation; where one has more than it can do or ought to do, needless costs are incurred.

Fluorescent and incandescent lighting have different uses, corresponding to their natures so that the idea that fluorescent lighting will soon replace incandescent light is uninformed. Fluorescent lighting is in a very wide use because of its luminous efficiency which is from two to five times that of incandescent lamps; they are also cool and while fluorescent equipment costs more than incandescent equipment, the lighting bill is also cut from fifty to sixty per cent--a fact which overcomes the handicap. Fluorescent light is still spectrally incomplete in comparison with daylight but this is possibly balanced by use of "warm", incandescent light mixed with the "cool" fluorescent light but the best results for most purposes come from cool general indirect lighting by fluorescent lamps with warm local lighting by incandescent lamps.

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<sup>12/</sup> Harrison, Laurence S. and Luchiesh, Matthew. "Light, Vision and Seeing." Architectural Record, p.139, December 1943.

Direct Artificial Lighting is now mostly used for the lighting of objects leaving rooms to be lighted indirectly as a rule because of the development of fixtures of new types that have specific uses. Attic installations of lamps in the reflections are still in use where skylights are employed but as a part of the skylight scheme, it is not acceptable anymore. False skylights are devices for getting some of the effect of skylighting without skylights. However, what the false skylight can do, other means such as indirect lighting panels, can do better and cheaper. Spot lights, the most popular of which is the incandescent projector lamp, are in wide use. Lowered lights which employ incandescent or fluorescent lamps singly or in multiples are serviceable in that they throw their rays downward. Lowered ceilings, now commonly referred to by the specific trade name Louverall, are suspended ceilings made of crossed strips of metal or plastic of rectangular units. Lighting which makes use of lowered ceilings, lights the room as a whole semi-indirectly while permitting objects to be lighted directly by lamps placed for projecting.

Trough lights are surface-mounted fixtures, either open or with lens covers. Because they are exposed fixtures, they are slowly giving place to troffer lights. For museum purposes troffer lights are now covered by special directive lenses that place light at an angle desired. Troffers set in suspended ceilings of complete flexibility show many practical possibilities. Polarized light for direct illum-

ination will soon be found under adoption with the development of polarizing glass for diffusing sashes, troffer panels, and perhaps directing lenses. The principal advantage is in the reduction of glare and improved definition in seeing.

Indirect Artificial Lighting is general lighting for rooms. In order that it can carry out its purpose of providing favorable conditions under which to carry out object lighting, the matter of brightness contrast is its great concern. For separately lighted exhibits, luminaries should not be too bright or too dull and they should have brightness enough to take care of all parts of the room. Illuminating design is presently coordinated with architectural design, instead of using a "tacked-on" system of lights. This development is slowly eliminating suspended and projecting fixtures and may soon do away with them altogether.

Suspended Fixtures employ incandescent lamps and may be of indirect or semi-indirect type. By directing light to the ceiling, these shield the eyes from source brightness. Concealed lights are used to flood light to the ceiling from the tops of cases or screens. Lighting cones with ledges concealing light sources are a very effective means of indirect lighting especially--cone-lighting lends itself well to the use of either incandescent or fluorescent lamps. Lighting panels or shallow open coffers with light troughs concealed in their rims also offer many possibilities.

VENTILATION  
AIR CONDITIONING

Ventilation may be natural or forced, forced when the supply and removal of air is achieved by mechanical means and is often associated with heating and other conditioning; natural, when it is not used in the presence of air conditioning because flow of air from the outside means ingress of dust. Exhaust fans can be axial flow or propeller-loke that can be set in walks or radial flow or centrifugal (better placed at a distance from a room where silence is wanted). Fan selection is an engineer's problem so that it should not be undertaken without informed advice. The term Unit Ventilation for individual spaces is more loosely applied to units for complete air conditioning. These are collectively more costly than a central system. A central system for ventilation and preheating must include cooling and humidity control or it

is inadequate. Where a partial system is installed, ducts should be designed for complete conditioning and vents supplied at the top and exhaust at the bottom of each (contrary to the scheme for circulation of merely preheated air). Space should also be set aside for all the necessary central air conditioning equipment including space in the basement for heavy refrigerating machinery. Natural ventilation is important only if there is no central forced circulation of filtered air because if air is filtered, natural ventilation defeats the cleaning process.

Air Conditioning is "the process by which simultaneously the temperature, moisture content, movement, and quality of air in enclosed spaces intended for human occupancy may be maintained within required limits."<sup>13</sup> In general, the process involves taking outside air to circulate and perhaps recirculate after it has been filtered and treated to correct its temperature and humidity. Although the term is often used loosely to embrace only part of this set of procedures, air conditioning is in fact no less than year-round control of the temperature and moisture content of cleaned air that is moved through a building. The two ultimate objectives of air conditioning in museums--the comfort of visitors and employees and conservation of collections. Conditioning for comfort

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<sup>13/</sup> Heating, Ventilating, Air Conditioning Guide. New York: American Society of Heating and Ventilating Engineers Handbook, republished each year.

may be very needful but conditioning for conservation may be truly imperative.

Adequate air conditioning retards or eliminates shrinking, bulging, warping, and cracking that may come from temperature and humidity changes. It keeps dust that causes damage, heads off discoloration and growth of molds. It prevents substances from brittling, decaying and softening, and lengthens the life of adhesives. It protects against sulphur dioxide damage and minimizes silver tarnishing. Air conditioning is so important that any museum must either meet the cost of air conditioning or neglect a duty towards its charges. Although we know the conditions people need for comfort, we are not certain as to the requirements of collections. However, for museum materials it has always been assumed that constant conditions are best, although different materials may and do have different requirements.

Conditioning Processes go in sets. Cleaning air is a process of removing dust as well as any harmful fumes or unpleasant odors, an important process for both conservation and comfort. Dust and soot are removed from the air by filters which may be viscous medium filters or dry filters, but some museums have adopted dry filters--spray filters--but sprays have low efficiency in dust removal. Electrostatic precipitation is especially effective for fine particles of dust. For air winter removal of sulphur dioxide gas from the air of smoke filled cities, reliance is placed on an alkali dissolved in

the water of humidifying sprays. To remove odors for which museum visitors are responsible, the usual treatment is to keep the air changing and to add a sufficient amount of fresh air from outside.

Heating and humidifying is accomplished by centrally placed steam coils accompanied by sprays, all in sheet metal housing through which the air stream is forced on its way to distributing ducts. Cooling and dehumidifying are both accomplished by means of a cold spray or cold coils. Summer conditioning removes both the so-called sensible heat, making the air cooler and the latent heat, so enabling humidity to run off harmlessly either into pans under cooling coils or with water of cooling sprays. If there is available supply of very cold water, as from an artesian well, this may be used in the cooling coils or sprays, thereby reducing the trouble and cost of summer conditioning much. Most places, however, are obliged to chill the water themselves and for this refrigeration equipment is necessary. The usual refrigeration method employs a mechanical process and a refrigerant which enters the cooling coils (or the cooler of water supply as a liquid but which evaporates as it gathers up heat and passes or as a super-heated gas). When it enters the condenser, it becomes a liquid again.

Making air move within a building from the intake through the conditioning apparatus, by way of a system of distribution ducts to the space where the air is used, and on through ducts to the exhaust with more or less recirculation, is the work of



motor-driven fans. The type of fan most used in air conditioning is the radial flow, or centrifugal type which takes in air at one side and whirls it off from the blades of a sort of paddle wheel into a spiral casing that leads to a duct. Luck fans pull air through filters, coils, and sprays and push it on into the ducts that distribute it through the building. Air motion in a room has to be sufficient to bring in conditioned air and to remove used air with its unbalanced load of heat. The number of changes of air required in a room depends largely upon the number of people present and may be from about one change in two hours to ten changes in an hour. The amount of air that has to be moved for heat and moisture removal in summer is several times as great as that required for ventilation alone; ducts should therefore be of generous size.

Designing the System is work for the engineer consultant in cooperation with the architect. The type of system adopted depends upon many technical considerations. Two extreme plans for equipment layout are (1) those of the central system sending air through distributing ducts to the scattered spaces, and (2) the unitary system having a number of more or less self-sufficient compact assemblies each directly in the space it serves. Between these extremes there are various systems that divide their apparatus differently between a central boiler--refrigeration plant and scattered stations. Zoning meets the problem of adjusting service to disparate conditions in different parts of a building and is helpful in taking care

of load variations as the sun changes its position. If more of a plant is needed than the building fund can provide, or if future additions are planned, there should be initial allowances of space for central equipment and an adequate and properly arranged installations of ducts.

Fireproof Construction is a necessity with any museum with irreplaceable collections, especially. Since the contents of a museum are inflammable, no protection against fire started inside is sure but suitable fireproof construction can prevent the spread of fire. A reinforced concrete frame with all members protected by concrete or masonry or fireproofed finish is called for.

Akin to fire protection is construction against the hazards of war or in some parts of the country, against hazards of the earthquake. Actually, there is no complete security against war but damage can be minimized. Breakage caused by concussion is avoided through not having excessive overhead areas of glass or other construction with a small margin of safety. Immediate war danger can be met by emergency propping against debris load, exterior sandbagging, blocking of openings, and use of reinforced concrete slab points of extra vulnerability inside and out.

Foundation and Basement has to provide a sound and also dry lower part of the building although ordinary structural adequacy is not complete without effective damp-proofing. In choosing a site, dry and well drained land should be sought. Sometimes on any site, foundation walls require at least routine damp-proofing and special protective measures on a wet site, since even normally dry earth acquires moisture at times. Even where there are favorably dry soil conditions the basement or sub-basement floor should rest not directly

on the soil but on a nine-inch layer of broken stone slag or gravel under the cement. Basement foundation walls should be pargeted with three-quarters inches or more of cement grout and covered with three or more coats of hot pitch or asphalt, the latter applied cold if the emulsified product is used. Further protection by use of drain tile laid along foundation walls at the footing level is necessary. In addition, the basement itself needs to be adequately damp-proofed. The three methods of doing this are: (1) membrane damp-proofing with layers of felt bonded and sealed with tar pitch or layers of mastic, incorporated in the floor and walls; (2) integral damp-proofing, with compounds added to the concrete when mixed; and (3) surface damp-proofing with basement walls. Best results would be a combination of all three methods, especially first and third methods.

Reinforced Concrete Frame, or a fireproofed steel skeleton is now the rule for buildings. Modern aesthetic as well as functional and structural developments tend toward increasing light instead of bulky elements of construction.

Exterior walls must be adequate as defenses against the weather. The usual construction is in two main layers--an outer impervious akin to brickwood, and an inner pervious layer of hollow terra-cotta tile and in two layers, the two layers separated by a damp-proof layer and sometimes an air space as well. Damp-proofing is as a rear defense against the elements, the elements, the forward defense being the masonry wall itself.

Heating insulation in walls by having several layers built as above described is greatly increased by the presence of an air space between the inner and outer layers. Facing of walls is in stone as a rule although brickwork facing with stone trim is common. The stone used most often has been buff Indiana limestone particularly selected stone for uniformity or to give a color gradation from top to bottom. Brick is a less ostentatious material than stone. With limestone trim, brick has a very pleasing appearance because of its simplicity. For decorative purposes, there are molded bricks.

Concrete stucco over hollow tile walls of small buildings or as the facing of panel walls in the usual structural frame construction is in common use. New materials for exterior construction have been explored but the principal change is a greater use of glass. No substitutes have been yet found for the materials that are now in use. New materials should be studied with interest but judged by their performance. Glass has been used in its natural role as a material admitting light, not as a substitute for other facing materials. If it is to be used extensively in exterior walls, it must be of some type that does not impose excessive air conditioning loads and that does not put proper conditions of humidity out of reach by introducing places where condensation is sure to occur during cold weather. Heat and sound transmission by glass block is low although there are different types of glass

blocks which can be employed to throw light where desired.

Metal trim in doors, grilles, railings, door and window frames appears in almost all buildings. Bronze is customarily used because it is wholly satisfactory and weathers well. Cast bronze ornamental work is very appropriate for public buildings and extruded bronze is available for moldings and frames. Aluminum trim is in good appearance but it scratches easily and may warp from exposure. Stainless steel, available in bright, polished, and dull finishes is used extensively for exterior parts.

Partition Walls have to allow for flexibility of arrangements. Permanent partitions are made of hollow tiles of clay, gypsum, or concrete with the required interior finish. Less permanent partitions are of light fabricated material and in some cases, the divisions are made of the exhibition cases themselves. Glass block partitions are used as aids to lighting. Folding partitions are used perhaps to divide spaces temporarily, especially in the educational space in the building.

Floors are of reinforced concrete in fireproof construction. The three categories of floors are--the basement floor; the first, or main floor; and upper floors. The basement has been noted; the main floor is likely to bear the heaviest load because of the large and heavy exhibits; and the upper floors have lighter burdens as a rule. Floor loads, the live loads for which the floors of any building must be designed

are specified by building codes (usually from 70 pounds for office buildings to 250 pounds for heavy storage--warehouses, with intermediate requirements for middle-sized-buildings).

Cellular floors make a strong and comparatively light floor in which the corrugations, laid right across intermediate beams, form a system of parallel raceways, for electric wiring and pipes. These are made by spanning the spaces between the beams with a series of patented rolled-steel units that give a permanent corrugated sheet steel surface over which the concrete floor fill is poured.

Floors, particularly with exhibition space, should be true--changes of installation which may involve relocating partitions are greatly assisted by true floors. Besides cases and bases will shift on uneven floors and objects in an untrue case will march along shelves and decks.

The Roof is most recently, flat. Roof construction normally anticipates live loading of not more than fifty pounds to the square foot. Roof terraces, a bulkhead or penthouse may affect roof design. They are commonly of precast concrete slabs or patented roof slabs set between intermediate beams and overlaid with several thicknesses of an impermeable membrane tapped with a concrete fill and tiles or gravel in pitch. Drainage and weather proofing should be well planned--proper gutters, flashings, and water-tight construction are prime in the planner's concern.

Interiors in terms of wall involve architectural acoustics, which is the applied science of putting down noise and promoting sounds that are wanted. Street sounds can be shut out by double glazing and light framing of windows. Sounds from the museum's own machinery can be stopped by lead cushions or resilient fibre, cork, or rubber mountings under motors. To avoid the click of women's heels on corridor floors, a softer flooring may be employed. Besides these devices to prevent nuisances, the two kinds of acoustical problems for the museum architect are: (1) to assume the spiriting away of the sound of voices and rustle in exhibition rooms, of chatter in class rooms, and of work noises in offices and other workrooms; and, (2) to provide for the successful delivery of sounds that are made to be heard as speech in meeting rooms and music in auditoriums and garden courts.

Sound quieting by absorption is accomplished through acoustical treatment of ceilings and walls. Hard surfaces such as hard plaster, tile, and glass ordinarily absorb less than 5% of the sound that hits them. Acoustical platters, made for practical application with trowel or spray gun, blankets of mineral wool or hair felt designed to be covered with cloth, perforated metal plates, and structural and veneering boards and tiles of compressed granular or fibrous materials with various textures and types of perforation. These materials swallow a large part of all sound reaching them. The area of acoustical material needed to quiet a room depends on



both the room and the acoustical material employed. Auditorium acoustics consist both of getting reverberation within limits by absorption of sound and of building up the speaker's voice or other wanted sound to proper audibility by electronic amplification.

Stairways connect floors and are not used to get around architectural difficulties with elevation at the cost of causing serious museum problems. Rather than divided into scattered parts as where there are two or three steps from the vestibule to the lobby, a few more to adjacent exhibition rooms, etc., they should be arranged with grouped flights of steps. Scattered steps may interfere with moving cases and other heavy objects from place to place. The main stairway should connect with the lobby and should be placed for both convenience and space economy. This scheme would exclude stairs in an exhibition room as it increases fire hazard. Multiple public stairways as required by law may be met by having a staff stairway within reach of the public in an emergency.

Stairs should be in straight runs, fairly short, with ample landings at floor levels and between them. Stairways that do not have parallel edges all the way between landings are dangerous. For fullest fire protection are used doors that could be closed quickly or that would remain closed at rest. While this is hardly practical for the main stairway, secondary stairways can be planned thus. Flights of stairs should not hinder circulation. (Staircase must not become a well into

which little boys fall.) Half flights hugging the median plane would prevent anyone falling over the rail of the flight from landing in the basement. If stone is used for steps, it should be a kind on which wet shoes do not slip. A grasp rail at the sides of every flight throughout its whole length is imperative; it must not encourage sliding. (Metal lugs set in rails at intervals will solve this.)

Ramps and Escalators may replace stairways and elevators. These have advantages and disadvantages. Ramps are inexpensive in construction and operation while escalators are costly to run and install. Both take up considerable space but enormous crowds may have to be moved by these.

Plumbing should be concerned with drinking fountains, mop sinks in janitors' closets, wash rooms, shops, offices, kitchen water appliances. If there is a standpipe system, clearance should be allowed for pipe connections to all points where water will be needed in the building and to outside hose connections. There should be stop valves for boilers, showers, lavatories, toilets, and other outlets from the water supply system. The Boiler should have a drain to empty it for cleaning and sink drains in shops should have sediment traps to catch solid matter.

Hot Water requirements should be anticipated. A gas heater of storage type or an indirect system employing steam is used depending upon the size of the building. Basement drainage

to the sewer may need a sump pump and also standby electrical equipment in some sites. Low level plumbing may need a sewage ejector.

Electrical Installations including control and distribution of purchased current as well as electrical appliances are requirements in every part of the building. Room lighting has been discussed earlier. The Main electrical switchboard in the superintendent's quarters should allow for growth--an allowance of fuse blocks for added circuits. Power cut-offs should be labelled for emergency operations. Time switches may be installed for economy and safety.

The Distributing system should have ample raceway and conduit capacity, even reserve conduits. Door reveals can keep local light switches, watchman's signals and the like under cover. For lighting and operation of exhibits, outlets at many unpredictable points may be necessary. The satisfactory arrangement is an underfloor wiring system that can be tapped at any point. Lighting accessories have to be replaced frequently. Fixtures have been discussed earlier. Illuminated direction markers are popularly employed. Emergency lights to carry on if regular lighting fails should be attended to for safety; public spaces may be covered by stop-gap circuits--especially the congested spaces. Emergency exit lights are necessary. Emergency lights are fed by storage batteries that can be charged by the regular power supply. The watchman is best equipped with a hand flash lamp. Night lights should be

situated where employees can easily change them but not where strangers can readily remove them.

Vacuum cleaning can be successfully provided for either by checking on electrical outlets wherever a portable cleaner might need to be attached or by installing a central vacuum cleaning system with suction pipes to all key points in the building. Central installation develops more suction and holds it for much greater volume, takes the collected dust entirely out of the area being cleaned and has greater vertical reach.

Telephone installations range from the simplest to some fairly well-developed systems that carry heavy service loads. Large museums have a switchboard service with independent trunk lines and several toll loops, including public pay phones. The operator also takes care of the watchman's reporting system and the automatic fire and burglar alarm system. Every building needs house extensions to the entrances and to inside key points. Installing is the telephone company's business. A most useful electric device is a call system for finding staff members. Loud speakers or group of pleasing tones are used. Electrical clocks are usually found at the service entrance and where required. They are connected to alternating current supply ordinarily but in large institutions, a time system with a master clock and secondary clocks under its control are advantageous.

Burglary Protection effectiveness depends greater upon the number, and location, and construction of doors and windows than upon locks, alarms, and guarding. The growth of air conditioning has greatly simplified this problem since windows that serve as light openings but are never needed for air can stay shut until they are opened by authorized persons. Door locks should be of high quality and should be systematized so that all can be opened by the director's master key and that individual rooms can be opened by special keys also. Human watch is indispensable. When the building is open, the guards who keep their eyes on the public, including the doorman at the main entrance and the superintendent's man at the service entrance are the main watch. At all other times there should be one or more watchmen with an electrical tour to keep the watch safe and busy. A combined night watch and fire alarm installation which services can install is worth its cost beyond the pay of the watch. Under this plan, a key inserted periodically at one or more signal boxes connects with a central company or police station; any irregularity is at once investigated and a fire signal can be detected by the central station.

Fire Protection begins with fire-proof construction, already discussed. It also involves control--major fire hazards, including the boiler, the incinerator, the shops, and storages for inflammables. These should be contained within special walk and doors. Museum spaces with regard to fire hazards

are of two classes. (1) Spaces above the basement in which water damage might be as serious as fire damage itself--exhibition rooms, curatorial workrooms and storages, and the packing and registrar's room; and (2) spaces (basement level) in which damage of any kind would probably not be too serious--mechanical shops and storages for supplies, lumber crates, and equipment. For the first class, carbon dioxide extinguishing apparatus, either installed as an automatic system or as hand-type units together with portable units mounted on wheel trucks. Compressed Carbon Dioxide is easy to obtain and cheap; an automatic installation that works like a "gas sprinkler" is good as it includes a warning device that gives time for people to leave. For <sup>the</sup> second class water sprinklers can be used to put a quick end to any fire that starts.

The stage section with the theater should have its full provision of fire alarm and suitable extinguishing apparatus. Inflammable stuff should be kept close to metal-lined bins on wheels. In addition to all these, a water standpipe and hose are advantageous in any building. These provisions do away in an emergency with the need for hauling fire hose and minimize the time required for drastic action and limit the extent of possible water and fire damage. Fully important as means of putting out fire are means of detection and alarm. These may be operated either by fusion of alloy links or by expansion of gas in tubes. Sprinklers employed should be of a type that records an alarm when any head is open. Services of a

watchman are important in fire detection at an early stage. The smell of smoke may give warning long before conflagrations.

Display Windows differ according to planners' choice. The designer may well recall that more and more commercial windows are small and placed high and that the best museum exhibition zone is between forty and seventy inches from the floor. The windows should be wired for lighting and operation with exhibits. There should be general window lighting and adjustable overhead spotlights. The display case is better enclosed and equipped with entrance from the back or side, rather than a part of the room behind it. To prevent condensation in cold times, a unit ventilation that can hold relative humidity well below 30% is necessary. The deck should be of water-resisting material; in science museum windows, water should be on top.

Exhibition Furniture is involved in this study only as it may affect the design of the building. Exhibition cases are the first consideration in museum furniture. The case problem is simplified by having cases purchased under a separate contract rather than under the general building contract. In recent years, recessed wall cases of comparatively small size, usually set flush in false walls or furring, have taken the place of wall cases that stood free and could be moved about. This change throws the responsibility for finishing room interiors when exhibits are installed; the architect will want to make sketches to guide them. Case Frames are usually of bronze or aluminum commonly in satin finish. Frames should be well-built,

dust and vermin proof, moisture proof, secure against unauthorized access yet easy to open and good in appearance. Frames may have locks set in them and locks may be supported by pressure screws if these are needed for tightness or to avoid multiplication of locks. Each key needs proper identification.

Cases are described as vertical or horizontal according to the position of the glass through which the observer looks. Three types are in general use: (1) the wall case, a vertical case, free-standing or built-in, that has its back to the wall, (2) the center case, a vertical case that stands in the open to be viewed from any quarter, and (3) the table case, a horizontal case with a glass top through which objects are looked up from above. Size standards are out of established practical and aesthetic considerations. Thus, the tops of free wall cases are most often at the level of 78 inches from the floor and the housing of recessed cases is at the 84-inch level as a rule. Horizontal dimensions are determined by requirements of exhibits and by good proportioning to vertical dimensions (wall cases--42 or 60 inches wide in one panel or 84 inches wide in two panels by 15 inches from front and back; center cases--60 by 34 inches; and table cases--60 by 24 inches). Standard cases on the market are designed for adults but to accommodate children, a step or ledge, from 6-12 inches high is provided.

The best chances for special designing are offered by recessed wall cases, which should not form part of the building structure.



Suggestion has been made that recessed cases penetrate more permanent walls, so that case fronts would never need to be opened and that displays could be put in places from workrooms behind. Cases are not, themselves, displays. Elaborate moldings, ornamental legs, and ostentatious decorations are anachronisms.

Case interiors are largely the concern of the curator or the preparator. Case lighting is required to make the contents of the cases brighter than their surroundings. Elongate incandescent lamps place inside the frame heated and confined air and damaged the exhibits so that slender, cold, cathode, fluorescent tubes are more successful. Filter of patented luminated glass and polarizing glass are being explored and studies are promising.

Group cases, cases for dioramas and habitat groups are recessed cases. The most the architect can do to meet the needs of large groups is to give a clear light. A room containing groups may or may not have natural lighting as part of its room lighting scheme, provided that no light is placed where it will be reflected in the glass fronts of cases. Exhibition screens are used to give added exhibition surface, for membering long walls, and dividing floor space. Dimensions must relate to the scale of surroundings. Seats for visitors may be axial benches or settees which are common in picture galleries for people who want to sit close to objects on vertical display, many museums have provided small chairs or stools that can be

pulled around. Special chairs are made for children's museums.

Curatorial Equipment required in live storages consist of shelves, stacked trays, cabinets, picture cards, and other kinds of special furniture. The actual growth of collections is what should set the pace for provisions beyond the more or less temporary arrangements a museum gets when it takes possession of a building. Thus, the duty of the architect ends with giving suitable storage space that is well arranged for use and for expansion. Several kinds of equipment are in general use, but for science museums, the best known type is the specimen trays. These are commonly 20 x 24, 24 x 30, or 24 x 36 inches. Depths are 2, 4, or 6 inches. Unit cabinets to take the trays may be of wood or of metal with steel angle frames covered with sheet steel. They may have open fronts or tight front panels held by lugs or catches, or dictated by the character of the material stored.

Metal shelving for storage of specimens in alcohol and other objects, in study storage may be of special design. Standard steel shelving can serve the purpose admirably. Picture racks for storage of paintings with or without their frames are used in art and history museums. These racks are made in large rectangular units, having steel channel frames with expanded metal or woven wire mesh. The units are supported in series in a vertical position, each unit mounted with rollers on overhead racks so that it can be drawn out in the plane of its stored position. To improve this pattern, wheels have been

put on one runner and the racks kept from swinging by a gutter in the floor.

A fumigating chamber is always needed for use by the curator who finds dermestes beetles, moths, silver fish or other pests infesting collections in his care and for use regularly by the registrar to fumigate incoming accessions and borrowed things, for furs or textiles that might conceal pests on a piece of antique furniture hopping with fleas. Almost any large tank, having a wide opening capable of being sealed but the right provision is a special chamber made so that a hand truck can be wheeled in, the chamber then being hermetically closed and later exhausted to the out-of-doors. The fumigating chamber is usually under the care of the registrar who should be responsible for the presence of at least two people whenever it is used. Fumigants like hydrocyanic acid gas are employed. The most advantageous place for this unit would seem to be near the upper reaches of the freight elevator, where it is both accessible and out of the way.

SOLUTION TO THE PROBLEM

## S I T E

The selection of the site was given much deliberation since the utility of a museum depends largely upon location. The site selected for this problem is the northern tip of Paco district; facing Isaac Peral St., it is bounded on the southeast by Otis St. and on the north by a parkway. This site was also proposed as a part of Manila's New Civic Center and Central Park in the suggested development plan prepared by Mr. Louis P. Croft, adviser on Planning to the President of the Philippines. However, it has inherent merits of its own which will undoubtedly make it an ideal site for a national museum even when the rest of the civic center is detached or moved to another place.

Although it is located in a big city (Manila has a population of 983,906 which is roughly the population of San Francisco), it is accessible to all by easy means of conveyance at all times of the day, it being located along Isaac Peral St., one of the main routes which great numbers of people follow from their homes to their place of work or business. It is also close to Taft Avenue, the main traffic artery to the southern half of the city, and to the proposed Manila South Road. For those living in the surrounding residential districts, a pleasant walk will take them to the museum.

Tourist patronage and the attendance of visiting dignitaries are both assured by the proximity of the museum to Port Area and Luneta, favorite recreation areas of tourists, and the Malacanan Palace, the seat of the national government of the Philippines. Transients and tourists are therefore given all the chances in the short time that they can afford, to know as much of the country as would create a better understanding

of it and its people. A good number of schools such as, Justo Lukban Elementary School, Jefferson Elementary School, San Miguel Elementary School, etc., are relatively near - another important attendance factor.

A driveway from Isaac Peral brings the visitor to the building. To assure the safety of all visitors, a separate driveway is provided for delivery trucks; through the use of ramps, pedestrian and vehicular traffic do not intersect at any point. In front a reflecting pool affords a charming and interesting approach to the institution which aims to provide not only enlightenment but also pleasure for its visitors. The pool will display native water plants which ordinarily are hardly appreciated in their natural habitats by people. Such a display will arouse a healthful curiosity and stimulate inquiry, both of which the museum proposes to satisfy.

The location as above described offers great potentialities for the purposes which the museum plans to achieve.

## S I Z E     A N D     C O S T

The size of the museum is approximately 50% of the average suggested by Paul Marshall Rea in his statistical study of building size because of several reasons. In the first place, the National Museum is practically starting from scratch, thus its requirements do not call for a building large enough to correspond with the size of the population. Its needs are barely defined and it will probably take at least five years for it to develop fully. Secondly, the funds which may be appropriated for it will not suffice to provide for a worthy building. The author was careful and realistic not to apply Rea's data fully because social and educational habits of the Filipino people are in many respects dissimilar. The size of this museum is considered sufficient for the present but it was planned with a long-range view of the museum's future. The main unit planned is the nucleus of a bigger building: the building has a total floor area of 86,900 square feet and it will cost approximately P2,489,800 (\$1,244,900).

This scheme has the distinct advantage of having a kind of flexibility which will be enhanced as the building expands. Reinforced concrete-framed openings, 10 feet wide, are concealed and made to function as part of the outer wall, always ready to be opened up to serve as the doorways to the new units appended. As the museum grows, the exhibition halls will serve as the setting for principal exhibits, the objective of which will be the orderly exposure to the main crowd; the new areas will serve as space for less popular study displays intended for a minority of interested people.

## GENERAL FEATURES

The planning of this museum has been to a large extent dominated by climatological and earthquake conditions in the Philippines. One of the distinctive features of this building dictated by such conditions is the use of stilted construction to free the building from the hazards of destructive floods. The water level reaches a height of six feet above ground level during some typhoons and water from any source can be very destructive to the contents of a museum.

Another feature so imposed was the height of the building - this dictated particularly by local earthquake conditions. The frequency of earthquakes has made it imperative that the building be limited to three floors. The least earthquake vibration can cause considerable damage to collections and exhibits so that any heights has been avoided. A glance at the climatological and earthquake data in the appendix will show what an influential role nature plays in this part of the tropics.

Among the conditions prescribed by the authorities concerned is - that the visitor be imperceptibly persuaded to see most of the exhibits, if not all. The problem of circulation and routing have invariably baffled both planner and museum director; arrows painted on the floor and signs along the walls have been resorted to without real success. Reflective studies regarding visitor behavior have indicated that visitors prefer to see exhibits from right to left. With a counter-clockwise movement the visitor does not start with the end of the series.

All these factors have logically led to the radial scheme of development. Under this scheme visitors run through a greater part of the ex-



hibits, thus assuring a maximum coverage of the display. Circulation is facilitated when the flow is circular. Provision for the movement of both the casual onlooker and the interested visitor is also made simpler by arranging exhibits for different rates of progression - by providing an outer circuit of exhibits for everyone and an inner circuit for those who care to prolong their visit. Since the circulation takes its pattern from the layout of the building, a radial scheme clearly indicates the system of circulation to the visitor. A radial scheme gives the visitor exhibits mainly at his right to look at and installs the exhibits for inspection from right to left, counter-clockwise in a room. Ineffective forcing of left turns at doorways and clockwise circuit of display are thus avoided.

## MAIN BUILDING

### Ground Floor

In this part of the tropics rain falls at any time of the year, usually accompanied by moderate winds. In view of this, a covered parking area seems to be the only feasible provision for parking. A covered shed at some distance from the building is evidently impractical nor would a covered passageway from the parking space to the building be a complete protection from the rain which falls at variable angles and winds which would blow the rain to all directions. With these in mind, the best use has been made of the ground floor and in it was integrated the parking area. The cars belonging to the staff were assigned a portion of the whole area. The capacity of the museum and local car situation were considered in determining the size of the parking area. Parking of chartered busses has been afforded in the form of parallel curb parking behind the private car parking space.

The knowledge that food is available should the need for it arise is a significant aid in attracting large groups from farther places. At the same time the temporary and casual of a visitor is held longer when he is assured that he does not have to travel far to assuage his hunger. Concessions on the ground floor have been incorporated to satisfy these needs.

Ample space has been left for the public concourse to allow free social intercourse among visitors on their way up to the lobby and a free movement of the people.

At convenient points within the ground floor area are located the gardeners' storage and equipment rooms.

The inner periphery of the whole ground floor is backed by the retaining wall of the interior court while the outer periphery is all open.

The loading and unloading areas which are in full view of the main stairway are sufficiently expansive to accommodate six cars at a time. The front loading and unloading area is primarily for visitors coming in taxis or in private cars which are not meant to stay for the duration of the visit. The area situated at the entrance to the parking space is for unloading visitors who do not prefer to go all the way to the parking space and back to the main stairway and groups of visitors arriving in busses. The section located at the exit from the parking space is for loading visitors who would rather wait for their cars than walk all the way to the parking space and groups of visitors who came in by bus chartered for the visit. Intersection between visitors arriving on foot and coming from the bus loading and unloading area and vehicular traffic has been entirely avoided by the use of ramps. The ramp adjacent to the driveway is intended for those visitors arriving on foot while the front ramp is intended for those who arrive in public conveyances. The latter is covered for protection against the elements.

#### Main Floor

In planning the main floor several considerations were involved. Most important of these is the allowance for real flexibility, thereby enabling the director or whoever is concerned to enlarge or reduce room size

as desired, by the use of light, movable partitions. Simultaneously the circulation on the whole floor is kept undisrupted. Inevitable expansion in the future has likewise been assured by means of concealed doorways made to appear as part of the wall itself.

Spatial variety seems the most reasonable solution to what would otherwise repel visitors - the monotony of entering rooms of precisely the same size. To accentuate this spatial variety, wall openings into the interior court were used to give the visitors a view of the inner garden court. Efficacious and clearly indicated routing has been achieved by the alternate use of the different groupings of rooms such as the corridor-to-room and room-to-room arrangements. Besides being an effective system of circulation, this also makes for a more pleasant and interesting tour around the museum for the visitor, since a continuous and often dreary plowing through is escaped. The sizes of exhibition rooms have been based on a typical module of 25 x 45 feet, which the ideal size for the activities involved within them. Rooms much larger than these have been proven hardly acceptable to modern museum planning standards.

All ceilings are suspended, allowing for space to be used for air ducts and lighting circuits and for the recessing of flush lighting fixtures. This also promotes flexibility inasmuch as it allows for variation in ceiling heights. The maximum height of 16 feet is the most common feature of the ceilings used.

The requirements for a lobby in a modern museum as shown in the report have been met. By having one door which is both the exit and the entrance to the lobby and the rest of the building, maximum control of visitors is attained.

An information desk at the right side of the lobby directs public movement, including business callers, visitors, and student researchers. Easy access to the upper floors where the curatorial and administrative spaces are situated is in like manner controlled.

To accommodate the visitors, a check counter is maintained at the center of the lobby. The checkroom has been reduced to a counter since climate in the Philippines does not warrant a large and separate checkroom.

A sales counter is also featured in the lobby for the sale of publications pertinent to the museum and its activities, postcards, and souvenirs. Souvenirs have been thought of to promote the development of native crafts and local industries and also to attract alien patronage.

An orientation room which is meant to introduce the museum to its visitors is located at the head of the exhibition rooms. Telephone booths are tastefully located within the orientation room for the convenience of those who wish to use them.

A hall for special exhibits is at the center of the interior court, directly accessible from the lobby through a glass-walled passageway. It is provided with its own orientation room.

Stairways and ramps placed at reasoned intervals lead to the open air exhibits in the interior garden court so that visitors who prefer to bypass a certain series of exhibits may easily find access to those in the

open air. A ramp has been provided with sufficient amplex to allow the passage of sizeable objects.

Storage spaces are conveniently interspersed throughout the whole floor and toilet rooms are likewise distributed with regard to the needs of the people served. Since in principle, the museum is like a continuous show theater, there is a absence of the so-called rush hour for the use of the toilet rooms. Therefore large toilet rooms are not imperative as long as they are large enough for a reasonably sizeable crowd.

Drinking fountains are installed at convenient points.

Planning the small theater included acoustics, flexibility, and multiple use. A movable modular partition which is used in all exhibition rooms may serve as the separation between the small theater and the classroom. The same partition, at appropriate times, can be taken down to expand the theater or the classroom when the other is not in use. Equipment for both the small theater and the classroom such as folding chairs and tables allows for varied activities including seminars, even tea parties. Both can be used separately without involving the rest of the building although they may use the same toilet and lobby facilities.

All the exhibition rooms are cleared of any windows whatsoever because natural light offers many problems of control. A more fitting method of lighting has been found to be a completely artificial lighting system. This way, brightness, contrast, and light quality are directly controlled, factors which are significant in the display of exhibits.

The whole floor is air conditioned.

### Third Floor

The administrative offices are located right next to the stairway from the second floor so that the administrator is within easy reach of business callers. At the same time they are within supervising distance to the curatorial suites, service areas, and the library which are all located on the third floor.

Toilet facilities for the staff workers and possibly research students are located at convenient points and so are fire escapes.

The curatorial suites are spacious and so organized as to offer maximum usefulness. To meet the need for expansion which will be made imperative by the growth of collections, more than sufficient space has been allotted each curatorial division. Orderly arrangements of study rooms, curatorial workrooms, and live storages provides for control of the various parts of the third floor. Each curatorial suite is afforded its own preparation room.

The corridor is ample enough to allow the passage of large objects. To offset the apparent waste of space when the corridor is not so used, it may serve as browsing or rest area for the staff members, perhaps including researchers and interested students.

Drinking fountains are a must on this floor since most of the people who frequent this place are workers of some sort.

## S E R V I C E     B U I L D I N G

The service building is approached by a driveway distinct from that of the other parts of the institution. It is at best separated from the rest of the building because work here may involve preparation of specimens that are better distant from the exhibition rooms, i.e., tanning or bone cleaning by beetles. Besides, vibrations that may arise from any form of machinery will be minimized.

### Ground Floor

Here situated is the loading and unloading platform which is in full view from the superintendent's office on the same floor. Close to the platform and the superintendent's office is the packing and unpacking area with a crate storage adjacent to it.

An 8 x 15 feet freight elevator is installed to facilitate the delivery of objects to different levels and may also be used by the staff workers in the service areas.

Dressing and locker facilities with showers are provided for the force of laborers. Lounging facilities have not been provided because the psychology of the average Filipino does not warrant these. The concessions are close enough to them although only a few of them will want to go to the concessions. As a rule, Filipino employees and laborers prefer to bring their lunches and would rather eat at their desks than buy and eat their food elsewhere. This will also involve the staff workers on the third floor of the service building.



## Second Floor

On the second floor are found the registrar's room where all the records are kept and the photography workroom. Case storages and carpentry shops are situated where they are of greatest use. Toilet facilities for the staff are provided.

## Third Floor

The main preparation and restoration room is found on this floor. This involves work on huge objects which can hardly be contained in the curatorial workroom. A fumigating chamber is located on this floor to minimize damage from gases.

## Fourth Floor

The air conditioning plant is situated here.

## C O N S T R U C T I O N

Fireproof reinforced concrete has been adopted for this particular building since it is most suitable to the tropics. The effect of lightness has been achieved by the use of slender columns employing steel shear heads. To conceal the columns of the two outer rows and the spandrel beams, thus giving a beautiful effect in the exhibition rooms, the use of double walls of concrete blocks, with an air space between, has been deemed most practical. This practice would cause an unnecessary increase in cost since a wall in this museum would always need finishing on two sides anyway. In fact this would lighten the load if two walls collectively thinner than one wall would be used. This will even contribute to thermal insulation. Exterior walls are of hollow concrete blocks finished with cement stucco and in some places these are of low conduction glass.

Floors and the roof are of reinforced concrete. The roof is overlaid with several layers of impermeable membrane, topped with concrete fill. Proper gutters provide for efficient drainage.

Stairways and ramps are likewise of reinforced concrete. Overall use of reinforced concrete has been specified for this building since it is supposed to house many irreplaceable collections. Experience in the Philippines has shown that a reinforced concrete structure is the best protection against fire of either external or internal source and perhaps against burglary.

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A P P E N D I X



REPUBLIC OF THE PHILIPPINES  
Department of Commerce and Industry  
WEATHER BUREAU  
Manila

File No. CS- 777

July 7, 1951

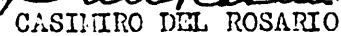
Mr. Serafin Aquino, Jr.  
Graduate House, M.I.T.  
Cambridge 39, Mass.  
U.S.A.

Sir:

Attached herewith are the climatological and earthquake data you requested for, last July 5. A chart and an article on earthquake observations have been included also to supplement the earthquake data required.

Please remit to this Office the amount of two pesos (P2.00) as nominal charge for the service rendered.

Respectfully,

  
CASIMIRO DEL ROSARIO  
Director

SLK/

REPUBLIC OF THE PHILIPPINES  
Department of Commerce and Industry  
WEATHER BUREAU  
Manila

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CLIMATOLOGICAL DATA FOR THE CITY OF MANILA

M O N T H	T E M P E R A T U R E (°F)*				
	Mean	Mean Maximum	Mean Minimum	Highest On Record	Lowest On Record
January.....	76.8	86.4	69.0	95.4	58.1
February....	77.8	88.0	69.0	96.1	60.1
March.....	80.1	90.8	70.1	98.1	61.2
April.....	82.8	93.4	73.3	100.4	63.0
May.....	83.4	92.8	75.3	101.5	68.0
June.....	82.2	90.5	75.4	99.7	70.9
July.....	80.6	87.8	74.8	97.3	69.4
August.....	80.7	87.4	75.0	95.4	69.1
September...	80.3	87.6	74.7	95.5	69.4
October.....	79.9	88.0	73.6	95.2	67.1
November....	78.5	87.1	72.1	93.2	62.2
December....	77.2	86.4	70.3	94.2	60.3
Annual.....	80.0	88.8	72.8	101.5	58.1

M O N T H	R A I N**		W I N D***		RELATIVE****
	Average Amount (inches)	Average No. of Rainy Days	Prevailing Direction	Average Speed (m.p.h.)	HUMIDITY Mean (%)
January.....	0.91	6	NE Quad.	4.1	77.2
February.....	0.44	3	E Quad.	4.9	73.3
March.....	0.69	4	SE	5.3	70.7
April.....	1.31	4	SE	5.6	69.4
May.....	5.06	12	SE	5.5	75.2
June.....	9.93	17	W Quad.	5.6	80.9
July.....	16.84	24	W Quad.	6.7	84.4
August.....	16.58	23	W Quad.	7.7	84.6
September....	13.95	22	W Quad.	6.1	85.1
October.....	7.61	19	W Quad.	4.1	83.4
November.....	5.53	14	NE Quad.	4.1	82.2
December.....	2.67	11	NE Quad.	3.8	80.6
Annual	81.52	159	-----	5.3	78.9

\* Temperature values were based on Manila records for 61 years.

\*\* Rainfall data were computed from records for 80 years.

\*\*\* Wind data were based on records for 46 years.

\*\*\*\* Relative humidity values were based on records for 61 years.

Climatological Data for the City of Manila (Continued)

M O N T H                      NUMBER OF TYPHOONS\* THAT OCCURRED (PERIOD: 32 YRS.)

	Affecting the Philippines	Passing within 75 miles of Manila
January.....	3 .....	0
February.....	0 .....	0
March.....	0 .....	0
April.....	3 .....	0
May.....	4 .....	1
June.....	11 .....	3
July.....	15 .....	1
August.....	17 .....	2
September.....	22 .....	2
October.....	22 .....	4
November.....	17 .....	4
December.....	9 .....	3
Total	123	20

\* Only remarkable or destructive typhoons were considered in the actual counting of disturbances.

GENERAL REMARKS:

Greatest 24-hour rainfall recorded at Manila: 13.23 inches  
 Greatest wind speed : 118.5 m.p.h.  
 However, gusts up to 60 mph are frequently observed during typhoon occurrences near Manila.  
 Highest temperature : 101.5°F  
 Lowest temperature : 58.1°F

The data enumerated were computed from the records of observations taken at the Manila Central Office of the Weather Bureau:  
                   at P. Faura St., Ermita           from 1865 to 1940  
                   Lipa St., Sampaloc           1946 to 1947  
                   Marsman Bldg., Port Area       1948 to ----

DISTRIBUTION OF SEVERE EARTHQUAKES IN MANILA

<u>Year</u>	<u>Month</u>	<u>Intensity</u> (ROSSI-FOREL SCALE)
1599	June	IX
1600	January	VIII
1601	January	VIII
1610	November	IX
1645	November	X
1645	December	IX
1646	March	VI
1653	May	VI
1658	August	IX
1663	June	VIII
1683	August	VII
1699		VII
1716	September	VI
1728	November	IX
1749	August	IX
1766	December	VI
1767	February	VI
1767	November	VI
1770	December	VIII
1771	February	VIII
1796		IX
1797		VII
1824	January	VII

DISTRIBUTION OF SEVERE EARTHQUAKES IN MANILA (con't)

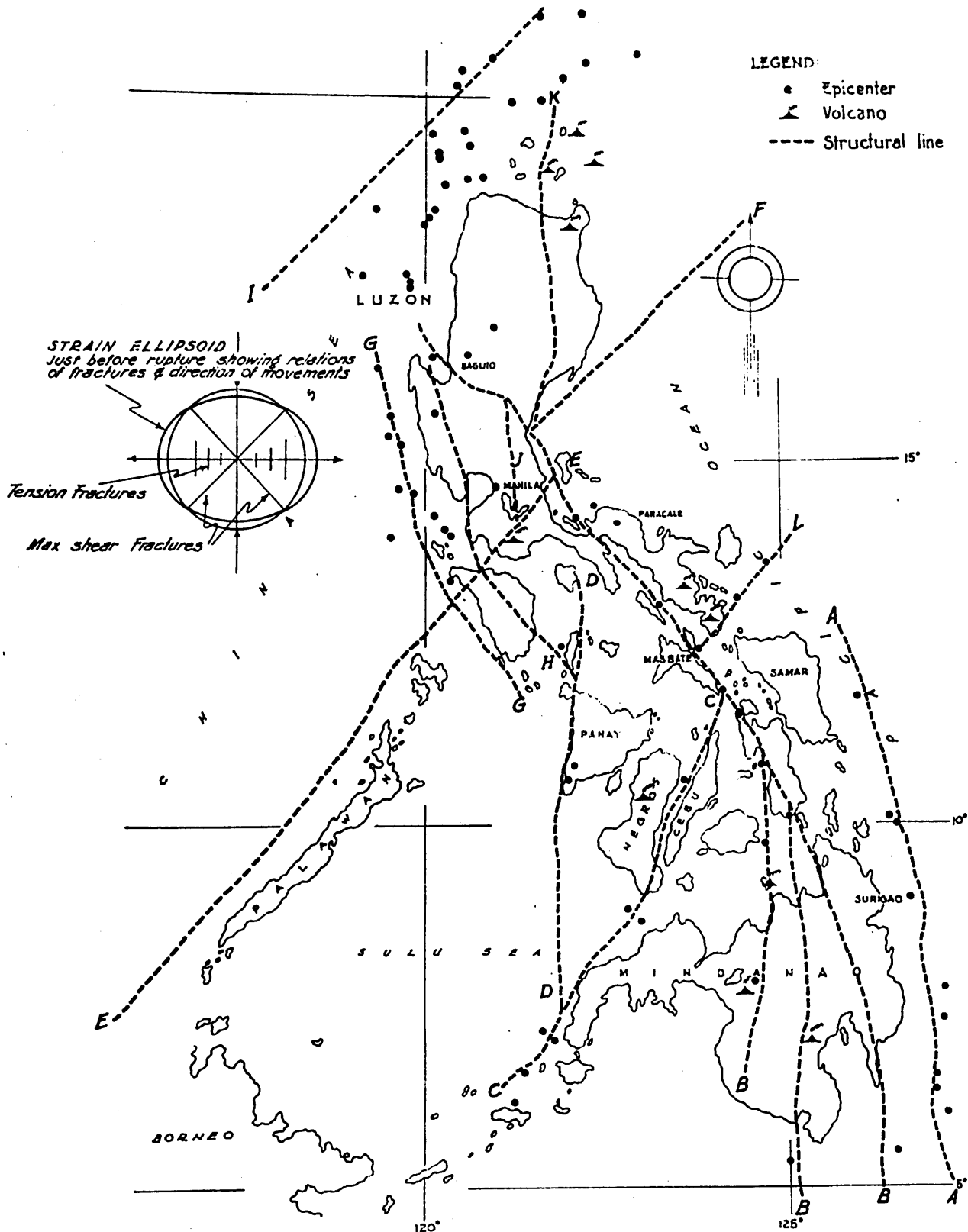
<u>Year</u>	<u>Month</u>	<u>Intensity</u> (ROSSI-FOREL SCALE)
1824	October	IX
1828	November	VIII
1830	January	IX
1852	September	IX
1862	March	VI
1862	July	VI
1863	June 3	X
1863	June 9	VII
1865	November	VI
1869	October	VIII
1880	July 19	IX
1880	July 20	VIII
1881		VII
1926*	October	VI
1927	June	VI
1928	March	VI
1928	September	VI
1937	August 20	VII
1948	December 10	VI
1949	December 29	VI

\* A few years before the original Rossi-Forel Scale of ten intensities was adapted to Philippine conditions and reduced to only nine intensities. The adapted scale is still presently the one being used by the Philippine Weather Bureau in judging earthquake intensities.

ROSSI-FOREL SCALE OF EARTHQUAKE INTENSITIES (Adapted)

- I. Hardly perceptible shock: Felt only by an experienced observer under favorable conditions.
- II. Extremely feeble shock: Felt by a small number of persons at rest.
- III. Very feeble shock: Felt by several persons at rest. Duration and direction may be perceptible. Sometimes dizziness or nausea experienced.
- IV. Feeble shock: Felt generally indoors, outdoors by a few. Hanging objects swing slightly. Creaking of frames of houses.
- V. Shock of moderate intensity: Felt generally by everyone. Hanging objects swing freely. Overturn of tall vases and unstable objects. Light sleepers awaken.
- VI. Fairly strong shock: General awakening of those asleep. Some frightened persons leave their houses. Stopping of pendulum clocks. Oscillation of hanging lamps. Slight damage in very old or poorly built structures.
- VII. Strong shock: Overturn of movable objects. General alarm, all run outdoors. Damage slight in well-built houses, considerable in old or poorly-built structures, old walls, etc. Some landslides from hills and steep banks. Cracks in road surfaces.
- VIII. Very strong shock: People panicky. Trees shaken strongly. Changes in flow of springs and wells. Sand and mud ejected from fissures in soft ground. Small landslides. Slides in river banks.
- IX. Extremely strong shock: Panic general. Partial or total destruction of some buildings. Fissures in ground. Landslides and rock falls.

Most of the earthquakes felt in the Philippines, as elsewhere, are of the tectonic type which are due to the sudden displacement of the earth's crust along a line of weakness or fault. Only is it occasionally volcanic as was the case in the series of earthquakes felt over Manila and Southern Luzon in 1911 when Taal Volcano erupted.



PROBABLE MAJOR STRUCTURAL LINES OF THE PHILIPPINES  
(Based on seismic, geologic & hydrographic evidences)

Prepared by Arturo Alcaraz  
Geophysicist, Weather Bureau

## A NEW TYPE OF ILLUSION EXHIBIT

The use of mirrors has been exploited to enhance the aspect of miniature exhibits and in particular, dioramas of outdoor habitats or vistas. Director Albert Parr of the American Museum of Natural History who was responsible for this new idea, has accurately called it a mirroscope. It is comparatively cheap and easy to set up.

Diagram 1 shows the case design with the position and angle of the mirrors, as well as the position of the exhibit. A and B are plate-glass mirrors, with reflecting surfaces opposing. The top mirror is centered at eye level, the lower one set at about 10 inches above the floor. This lower mirror picks up the picture, while the top one reflects it to the eye. When viewing the exhibit through the front aperture, it appears at the end of a "square" tube about 6 feet away. There is no consciousness of mirrors, and the illusion is that of considerable distance, with a real feeling of the out-of-doors. It is this illusion of expanse and realism that intrigues one, for there is actually a feeling of looking out upon nature itself. Diagram 2 is a perspective sketch which shows the mirror housing and the exhibit housing, which are built as separate units, and their assembly without the covering walls.



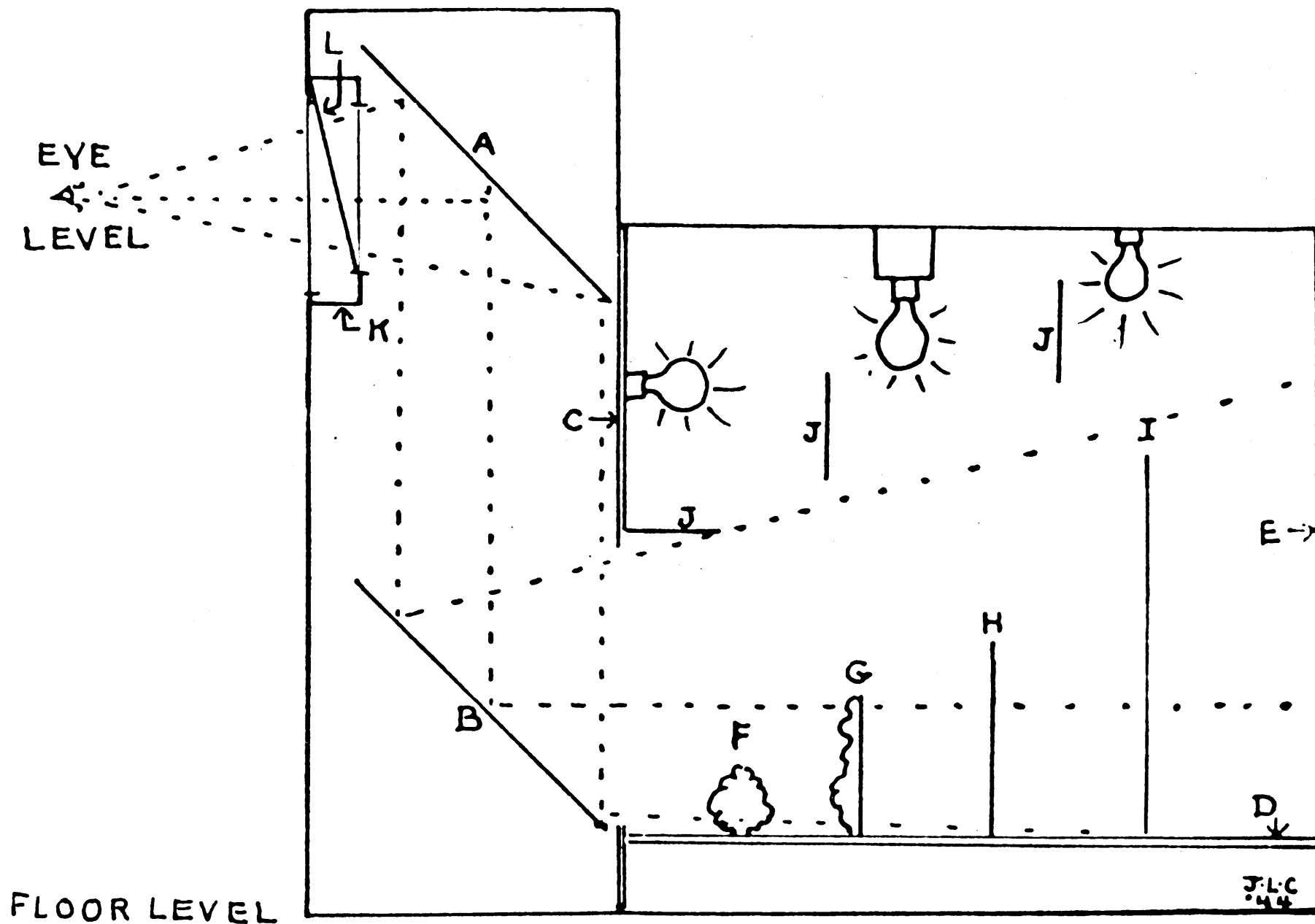


DIAGRAM 1

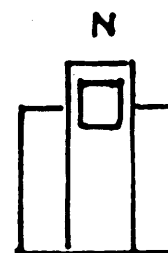
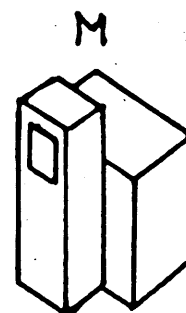
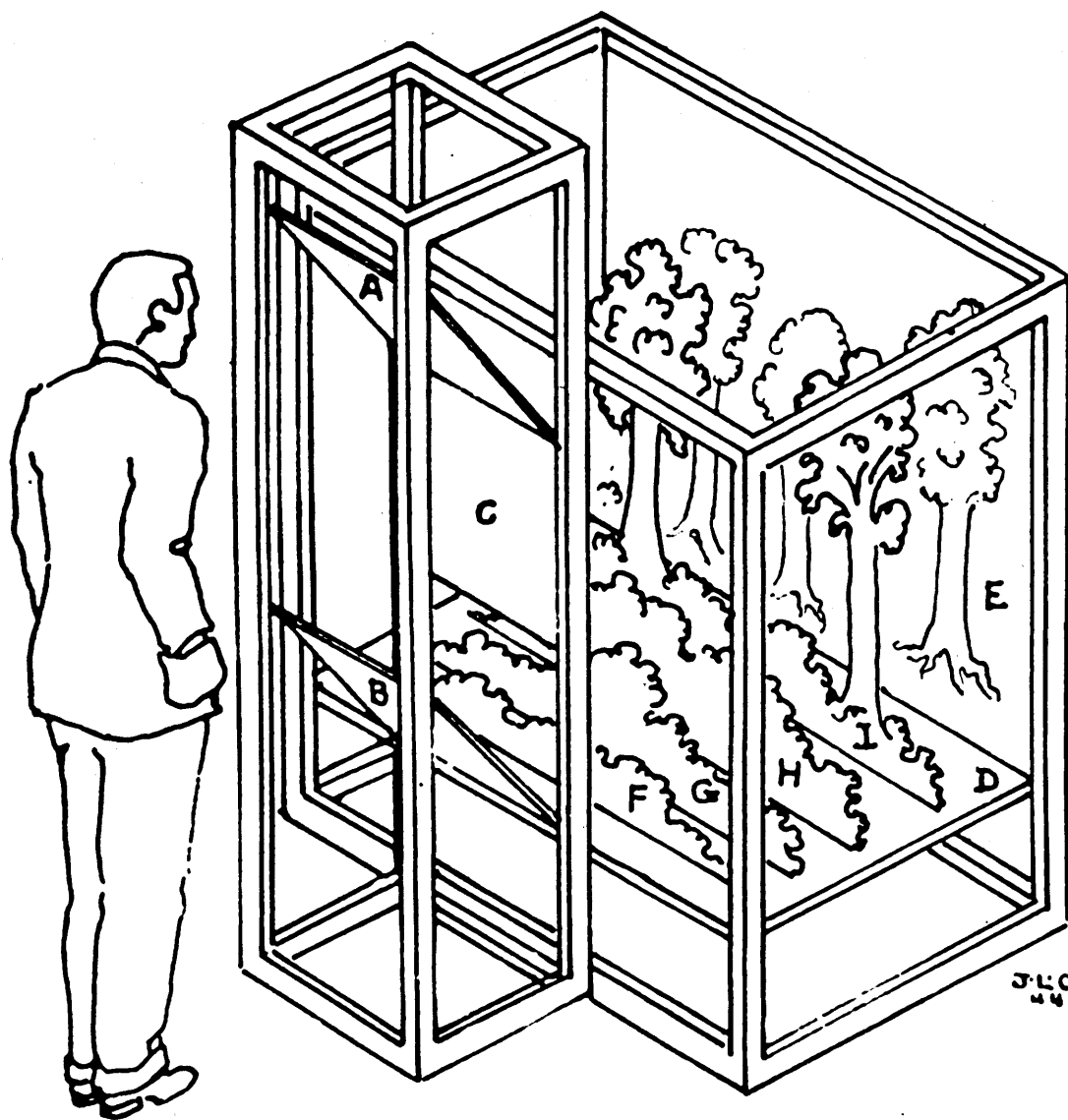


DIAGRAM 2

# THE NATIONAL MUSEUM

AT MANILA, PHILIPPINES

THESIS FOR MASTER IN ARCHITECTURE

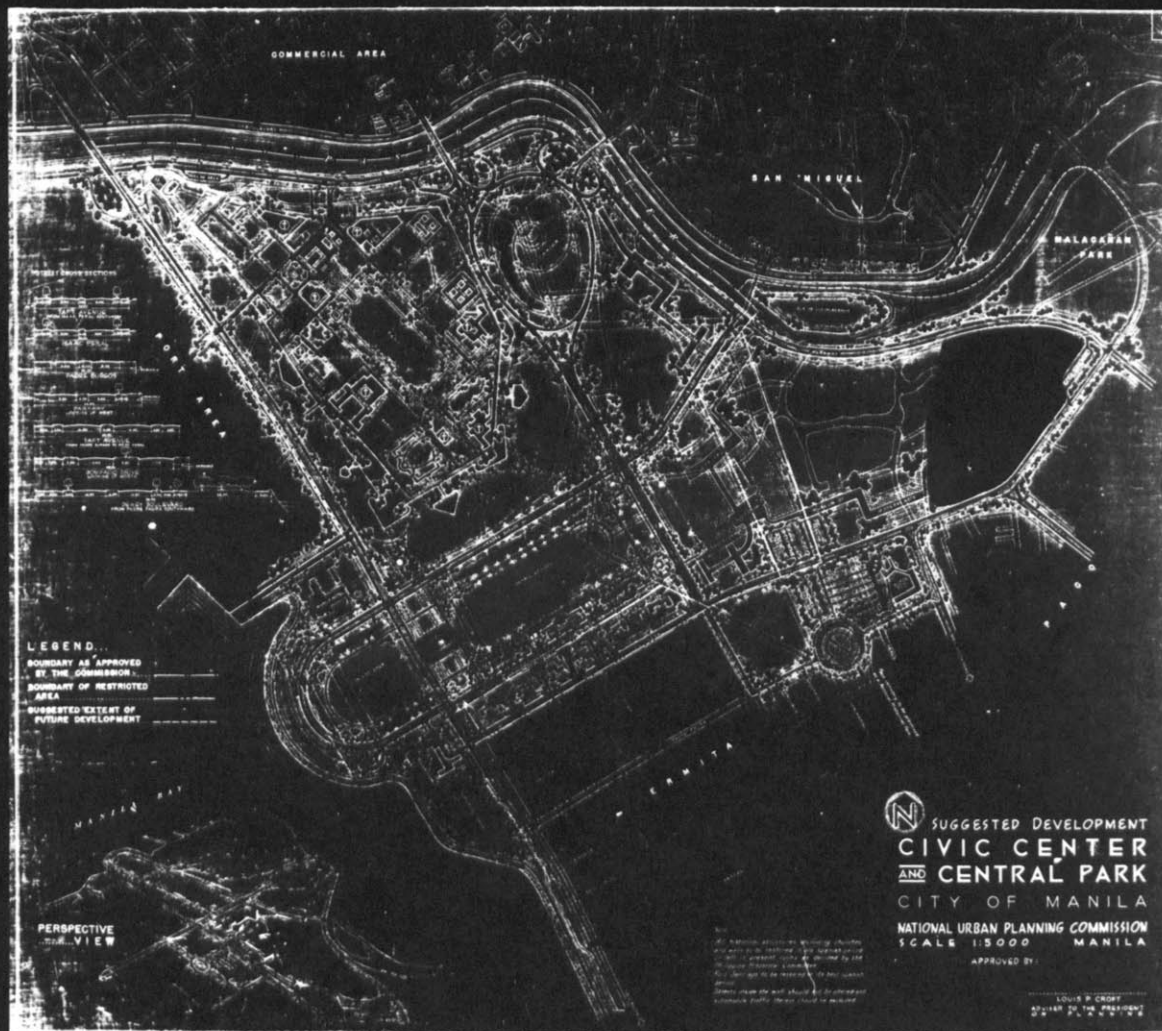
serafin & aquino, jr.



taken march 31, 1945



taken december 13, 1944



T H E S I T E

NORTH ↑

P A R K W A Y

OTIS STREET

I S A A C  
P E R A L S T.

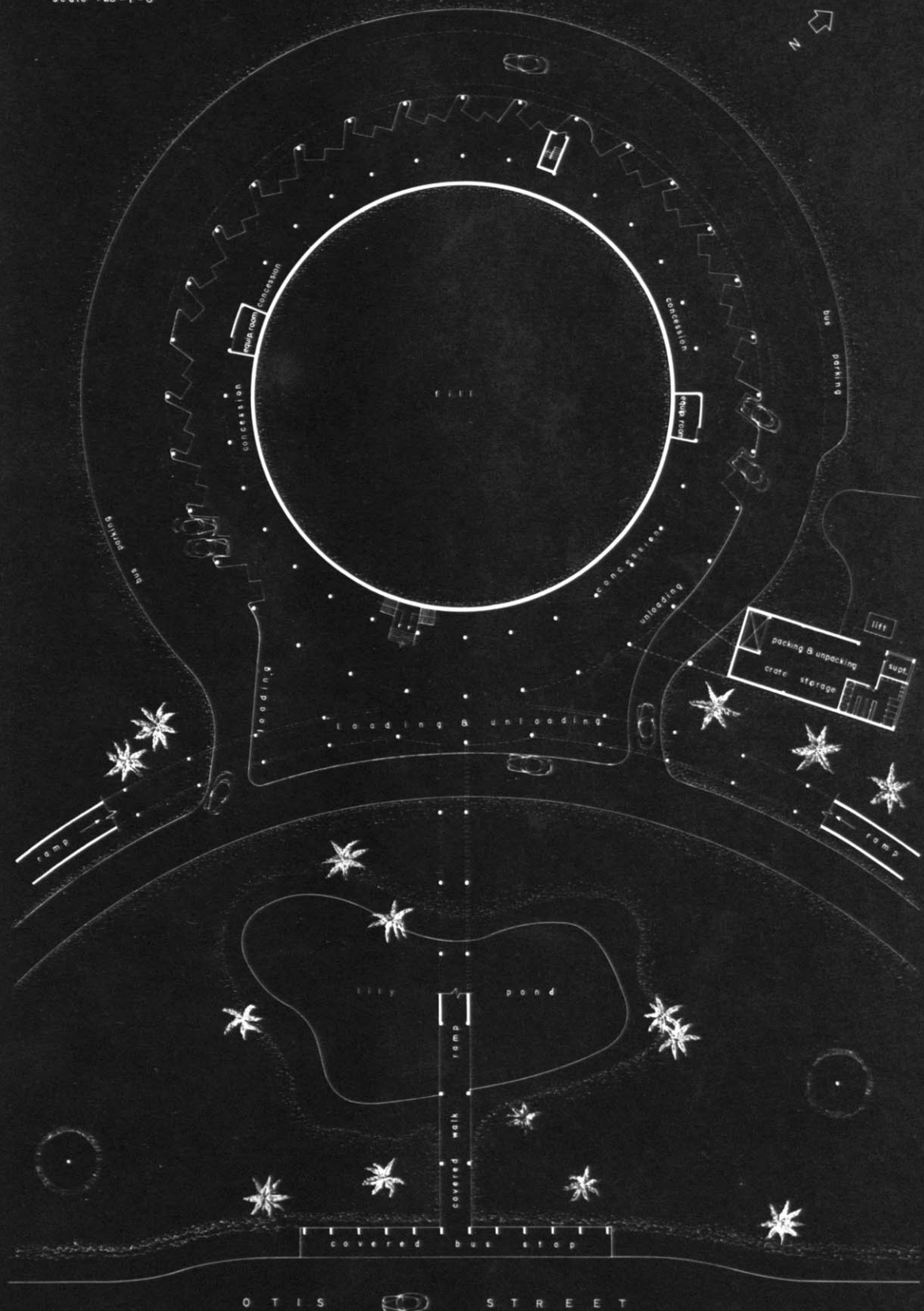
C A N O N S O

PLOT PLAN  
scale 1/2" = 1'-0"



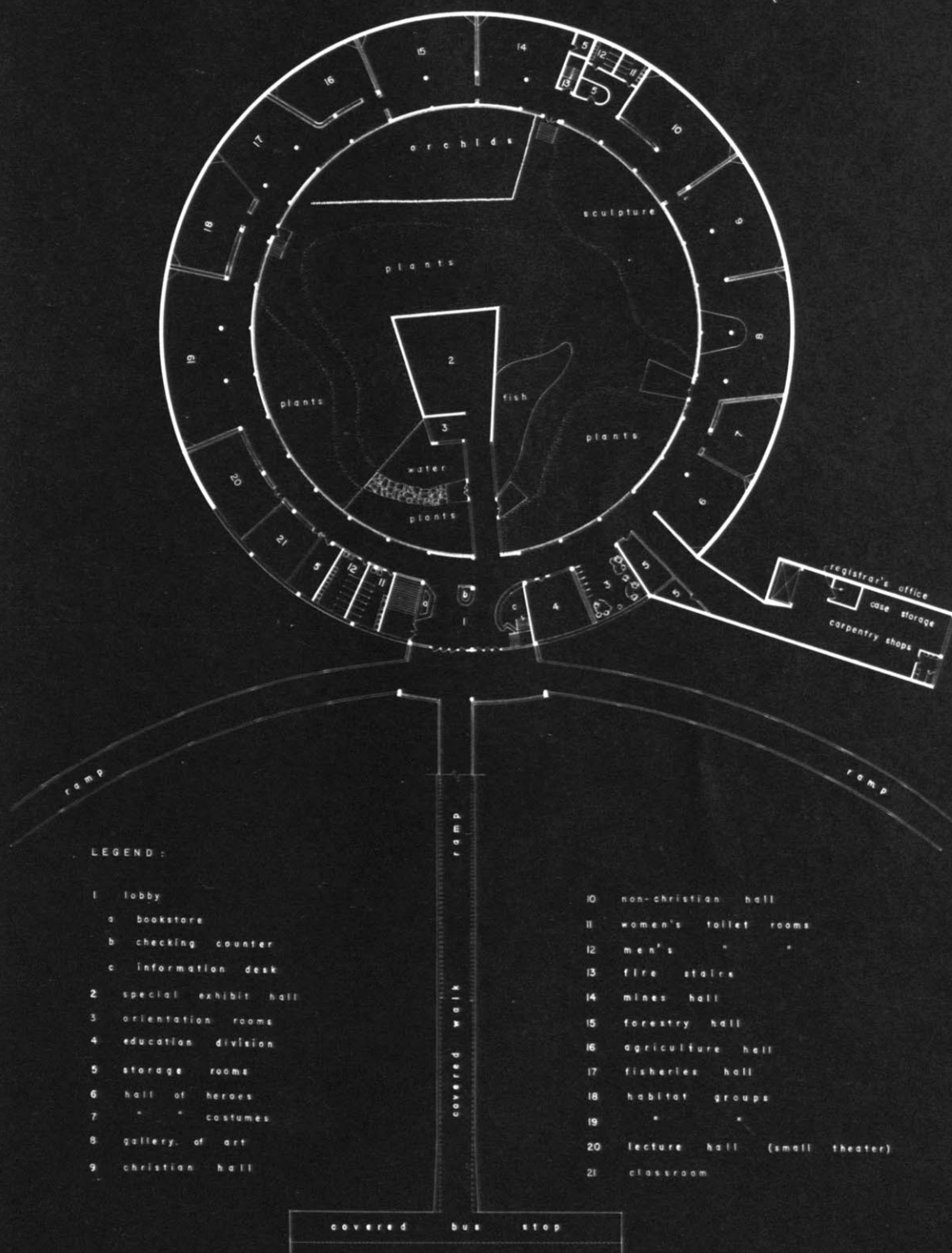
GROUND FLOOR PLAN  
scale 1/20" = 1'-0"

41



SECOND FLOOR PLAN  
scale  $\frac{1}{20}'' = 1' - 0''$

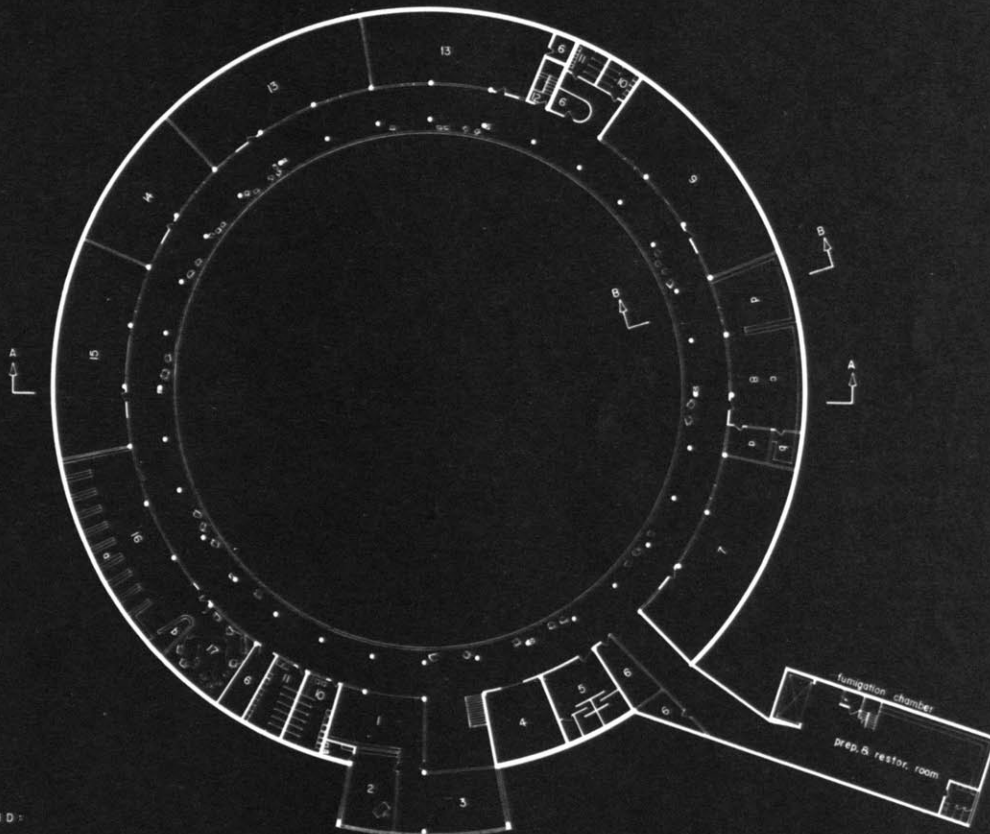
NORTH ↗



# THIRD FLOOR PLAN

scale  $\frac{1}{20}'' = 1'-0''$

NORTH ↗



## LEGEND:

- 1 curatorial office
- 2 director's office
- 3 educational "
- 4 supply room
- 5 photographic room
  - a storage room
  - b film room
  - c printing room
- 6 non-curatorial storage room
- 7 anthropology
- 8 botany
  - a office
  - b washroom & coatroom
  - c study room
- 9 geology
- 10 women's toilet rooms
- 11 men's " "
- 12 fire stairs
- 13 zoology
- 14 history
- 15 art
- 16 library
  - a stacks
  - b librarian's desk
- 17 browsing room

## FOURTH FLOOR PLAN

### SERVICE BUILDING

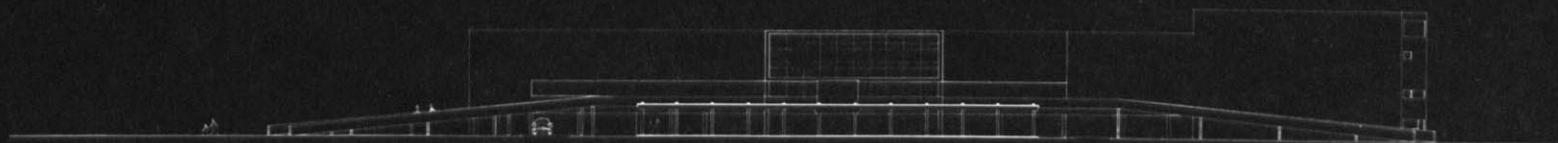
scale  $\frac{1}{20}'' = 1'-0''$







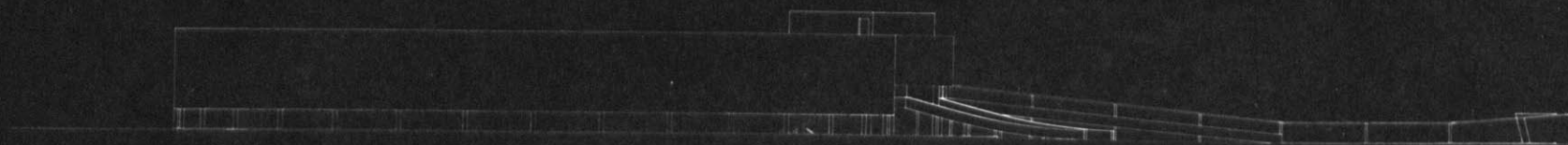
NORTHEAST ELEVATION  
scale  $\frac{1}{20}'' = 1'-0''$



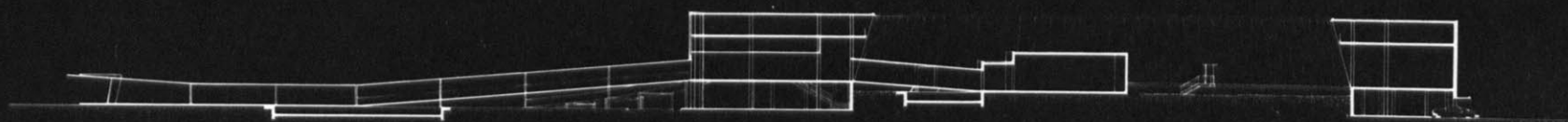
SOUTHEAST ELEVATION  
scale  $\frac{1}{20}'' = 1'-0''$



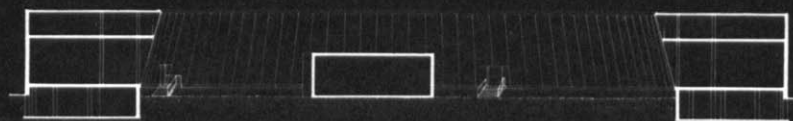
NORTHWEST ELEVATION  
scale  $\frac{1}{20}'' = 1'-0''$



SOUTHWEST ELEVATION  
scale  $\frac{1}{20}'' = 1'-0''$



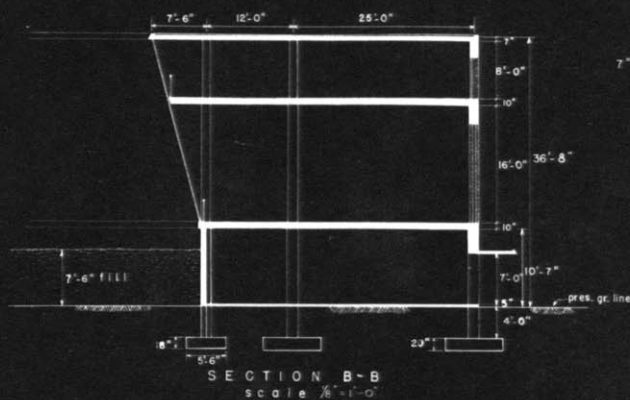
LONGITUDINAL SECTION  
scale  $\frac{1}{20}'' = 1'-0''$



SECTION A-A  
scale  $\frac{1}{20}'' = 1'-0''$



## THE BUILDING



## THE RAMP

